# The political institutional and firm governance determinants of liquidity: Evidence from North Africa and the Arab Spring

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## Abstract

This study undertakes a unique comparison into the relative efficacy of four well established liquidity measures, namely turnover, proportion of daily zero returns, Amihud (2002) and Liu (2006), in explaining the bid-ask spread plus brokerage costs when powerful and common firm governance mechanisms are taken into account as controls. These are representative of ownership of listed firms by state, long term foreign partners, entrepreneurial founders, single family entities, extended family groups and business networks, domestic and foreign venture capitalists. An additional control for firms within business network controlled by former Tunisian premier, Ben Ali, and Morocco's royal family is also included. Using a unique sample of all listed firms across the equity markets of Egypt, Morocco, Tunisia and Algeria I find evidence of equity capital rationing during the Arab Spring period of political upheaval. Less well regulated SME markets such as Morocco's marche croissance have liquidity-based transactions costs attributable to Arab Spring four times those of the marche principal while those in Egypt's Nilex are twenty times those of the prestigious EGX30 index. Finally the greatest changes in political risks associated with aggregate liquidity across the Arab Spring are democratic accountability, military in politics, and law and order.

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## 1. INTRODUCTION

The events collectively referred to as the Arab Spring, which started in Tunisia in mid-December 2010 with the self-immolation of Mohamed Bouazizi, has generated an unprecedented wave of political upheaval across the Middle East and North Africa (MENA) region (BBC website, 2012). In North Africa alone this has resulted in the popular overthrow of governments in Tunisia, Libya and Egypt while substantial political and governmental reforms have been conceded in Morocco and to a lesser extent Algeria. These reforms have focussed principally on the dismantlement of narrow, rigidly controlled political economies dominated by military social elites with considerable vested interests and private benefits of control. A major implication of these reforms is the impact on economy-wide transactions costs which in turn has implications for listed firms across the Maghreb region. As such the principal research question is to study the impact of Arab Spring political upheaval on the liquidity-based transactions costs in listed firms within different listings compartments, characterised by varying regulatory strength, in stock markets across North Africa.

The literature studying the efficacy of the considerable number of liquidity measures is well developed with this principally being focussed into two distinct strands. The first adopts a single-country perspective with studies such as Ghysels and Cherkaoui (2003) on Morocco and Lagoarde-Segot (2011) on Tunisia. These typically note the limitations in applicability of liquidity measures formulated in a developed, well regulated market setting, such as United States, in small, relatively inactive emerging markets where illiquidity is a particularly acute issue. The second strand is colloquially referred to as liquidity "horse races" with this focussing on the explicit contrasting of the robustness of a plethora of different measures in capturing liquidity. Lesmond (2005) studies the efficacy of four low trading frequency measures of liquidity in explaining total trading costs, defined as bid-ask spread plus broker commissions for a round-trip trade (both buy and sell legs) across a sample of 23 larger emerging markets. The liquidity constructs being the price-impact measure of

Amihud (2002), ubiquitous turnover ratio, effective spread measure of Roll (1984), and a zero returns indicator of Lesmond, Ogden and Trzinka (1999), henceforth LOT, that assumes a stock returns generating process determined by capital asset pricing model and uses a maximum likelihood application. Hasbrouck (2009) runs tests between four effective liquidity cost measures while the earlier LOT (1999) study finds evidence that the LOT zero returns measure outperforms both the Roll effective spread and simple proportion of daily zero returns (in this case evaluated over an annual time frame) measures. A serious drawback with all of these earlier horse race studies is their employment of annual or quarterly frequency liquidity measures. This is despite a now considerable literature relating to the incorporation of liquidity premia into asset pricing models that use monthly frequency data (see Pastor and Stambaugh (2003); Watanabe and Watanabe (2006) and Liu (2006)). Recently a study by Goyenko et al (2009) addressed this issue in undertaking a horse races analysis of 12 spread proxies and 12 price impact proxies in their ability to explain three liquidity benchmarks, with these being effective spread (of Lee and Ready, 1991), realized spread (of Huang and Stoll, 1991) and price impact (of Hasbrouck, 2009), using both annual and monthly frequency data. However while benefitting from studying a comprehensive array of liquidity measures a prominent shortfall is the lack of applicability of many of the measures in the context of smaller, less well regulated and active emerging markets. A very recent study by Hearn and Piesse (2013) partly addressed this issue in studying the efficacy of low frequency liquidity measures, namely turnover, multidimensional trading speed Liu (2006) indicator, and LOT (1999) proportion of zero returns in explaining total trading costs across a sample of Sub Saharan African (SSA) countries. However a common drawback across all these prior studies is a uniform observation time frame within which to study liquidity. A unique feature of the onset of the recent Arab Spring political upheavals in Egypt and Tunisia is the dismantling of autocratic state regimes with the being superseded by democratic popularist governments. This dramatic political change has been matched by substantial

reforms permeating throughout the economies across the Maghreb region. Consequently the onset of Arab Spring facilitates a unique study of the efficacy of an array of liquidity measures in capturing liquidity in equity markets embedded in two very different state level governance systems. These being: unreformed autocratic before a transition to reforming democratic popularist governments. This forms my first contribution to the literature.

The Hearn and Piesse (2013) study also partly addressed issues arising from a fairly extensive literature regarding the impact of concentrated block ownership on liquidity (see Chung et al (2010) and Edmans et al (2013) for full discussion) through the inclusion of a series of (1/0) dummy variables controlling for the presence of certain types of block-owners. These dummy variables addressed a long standing issue, highlighted in Rubin (2007), over the distinction between very different types of block and institutional owners and that even distinctions between these entities are often used inter-changeably. This builds from more dispersed evidence across the literature regarding the differing abilities of different types of block shareholder in alleviating asymmetric information and thus liquidity. In terms of state ownership and both Leland and Pyle (1977) and Perotti (1995) reveal evidence that retained ownership by the state (government) during the listing process acts to reduce informational asymmetries, thereby boosting liquidity, while signalling positive intentions by the state to minority investors in its joint role as insider within the firm and external controller of political and regulatory environment within which the firm is embedded. Long term foreign investors arising from foreign direct investment (FDI) are another prominent class of investor. Rhee and Wang (2009) find evidence in Indonesian listed firms that foreign investors are better placed to reduce informational asymmetry and thereby reduce liquidity. This finding is further elaborated upon by evidence from Ng et al (2011) that foreign direct investors increase informational asymmetry and illiquidity while foreign portfolio investors have the opposite effect. The broader agency literature also ascribes differential impacts on asymmetric information arising from entrepreneurial owner-founders retaining leadership (Jensen and

Meckling, 1976) with a lack of operational track record in many entrepreneurial firms serving to exacerbate asymmetries. Venture capitalist (VC) investors too can be categorized in terms of their bringing multiple agency relationships into the focal firm with these arising from their acting as managing agents of funds owned by their own external principal-investors (see Arthurs et al, 2008). Bruton et al (2010) argue that VC entities are best placed within the firm to signal value to minority investors and thus reduce informational asymmetries while Hearn and Piesse (2013) find evidence of a differential role between foreign VC enhancing liquidity while the opposite is true of domestic VC. A final ownership category considered in the Hearn and Piesse study is that of family controlled firms. The findings suggest that family control has a detrimental impact on liquidity. However a shortfall in this study is in the extremely broad classification of family – where this typically includes firms owned and controlled by singular family entities as well as those which are constituent to very large, extended business groups, containing many such firms bound together by a common controlling core family (see Khanna and Rivkin (2001) and Khanna and Palepu (1997) for discussion on family business groups). While there has been evidence of marked asymmetries of information perpetuated by the distinctive separation of ownership (cash flow rights) from control (voting rights), with this typically taking the form of pyramids, extensive cross-shareholdings and board interlocks (Claessens et al, 2000), it is only very recently that evidence in literature (Hearn, 2011, 2013) has supported anecdotal evidence of these family business groups permeating North African economies. Furthermore considerable media attention during the Arab Spring political upheavals has focussed on the roles of these extended business groups centred on close family members of ruling political elites in the expropriation of both public and private sector wealth. In this light my second contribution is in considering the impact on liquidity spreads arising from dummy (1/0) variables signifying ownership of the individual firm by state, long term foreign partners (FDI), founding-entrepreneur, domestic and foreign VC entities as well as a unique differentiation between the

firm being controlled by a singular family entity as opposed to being constituent to a much more extensive family-controlled business group. In order to assess the impact of ruling political family's business group in Tunisia and Morocco on liquidity I further account for individual firm's being constituent to Morocco's SNI business group, owned by King Mohammed VI, and the extended network of Tunisia's Ben-Ali.

The final contribution of this paper is in undertaking a study on the impact of state-level institutional quality across North Africa on liquidity in two unique pre and post Arab Spring sample windows. There are significant shortfalls in the previous literature relating institutional quality to liquidity. Lesmond (2005) employs quarterly data and a variety of institutional measures that are unrelated in their construction. Hearn and Piesse (2013) use World Bank Governance institutional measures, that benefit from being homogenous in their construction techniques, but a drawback is in their limited availability in annual frequency. Consequently I address these shortfalls in using seven ICRG (PRS) country-level institutional measures, namely corruption levels, investment profile, government stability, socio-economic conditions, military in politics, democratic accountability and finally law and order.

The data are a sample of 24,238 monthly bid-ask spread estimates for a comprehensive sample of listed firms across North Africa. Owing to considerable intra-market segmentation (see Hearn, 2010, 2011 for extended discussion on North Africa) I use listings segments (compartments) with their obvious variation in regulatory and disclosure requirements as a means to segregate listings into distinct markets. Thus the sample is comprised of three Moroccan markets, namely main board (Marché Principal), SME development board (Marché Développement), and high growth fledgling (Marché Croissance), one Tunisian market, namely main board (Marché Principal), and then three Egyptian markets, constituents of EGX30 index, those stocks in rest of market outside of this, and those stocks listed on Nilex SME development board. I find evidence that the liquidity costs in development and growth boards of all national markets have been influenced more by onset

of Arab Spring than top tier main boards inferring equity capital rationing with external stock market finance becoming progressively more costly in times of political upheaval. Generally the findings suggest that there is an indiscernible impact arising from foreign partner on liquidity, while state and entrepreneurial founder act to reduce liquidity. However individual family controlled firms as well as those constituent to extended family business groups are likely to have elevated illiquidity. A notable feature is that the business group of former political premier in Tunisia (Ben-Ali) increases illiquidity as is the case with Morocco's SNI business group in the context of the high growth market (Marché Croissance) with weak regulation, the opposite is true in the main board (Marché Principal). More generally I find evidence that the simple LOT (1999) proportion of zero returns is superior to other measures in explaining liquidity, defined as bid-ask spread plus commissions, across pre and post-Arab Spring sample time frames. Lastly I find evidence of significant differences in the institutional determinants of liquidity between pre and post-Arab Spring samples. This is most apparent in democratic accountability with this being associated to elevated illiquidity pre-Arab Spring while the opposite is true post-Arab Spring. This is most likely explained by a change in the type of government with autocratic state being overthrown and systematically reformed into a popularist democratic institution. As such this underlying change in type of government would also explain the increased importance of government stability and especially the military in politics institutional quality measures in post as opposed to pre-Arab Spring samples.

This study proceeds with the next section introducing the liquidity measures, their construction, and the firm governance and market controls. Section 3 outlines data, while section 4 details the empirical methods. Section 5 discusses results and the final section concludes.

## 2. LIQUIDITY MEASUREMENT AND DETERMINANTS

### 2.1 Liquidity benchmark: Total trading costs (Bid Ask spread and commission cost)

The bid-ask spread is calculated using the average of the available monthly quotes with a minimum of a single month's quote for that month and the average used for the spread. This minimizes outliers and averages out highs or lows in quotes that result from monthly sampling. Finally, following Lesmond (2005) negative bid-ask spreads and those that exceed 80% are removed. The monthly quoted spread is defined as:

$$Quoted\ spread_M = 1/2\left[\left(\frac{(Ask_M - Bid_M)}{(Ask_M + Bid_M)/2}\right) + \left(\frac{(Ask_{M-1} - Bid_{M-1})}{(Ask_{M-1} + Bid_{M-1})/2}\right)\right] \quad (1)$$

Following Lesmond (2005) the total trading transaction costs are estimated with the costs associated with a round trade being added on to the quoted spread for each month. Brokerage and Exchange fees are calculated from the fee schedules detailed in final column of Appendix Table 1. When a percentage commission fee is not provided the maximum fixed cost is applied to the aggregate daily traded value data.

### 2.2 Liquidity measures

#### 2.2.1 Proportion of zero daily returns measure

The proportion of daily zero returns measure over a period of trading days in a given month is based on the measure first introduced by Lesmond et al (1999). The monthly proportion of daily zero returns is calculated on a stock-by-stock basis using:

$$\frac{1}{D_M}\sum_{D=1}^{n}(ZeroDaily\ \mathrm{Re}turn) \quad (2)$$

where $D_M$ is the number of days in the month, M.

#### 2.2.2 The Amihud (2002) measure

Following Amihud (2002) and the more recent application by Lesmond (2005) the Amihud price-impact measure is constructed using closing stock prices to form daily returns. To

control for outliers, a data error filter eliminates daily prices that are +/- 50% of the prior day's price and that day's price as well as previous day's price were removed. Equally if zero volume occurs on day t, then that day is not included in the average. Finally, the measure is multiplied by $10^6$ following Amihud (2002) to provide a common representation of measures and facilitate comparison. The final measure is defined as:

$$1/D_M \sum_{t=1}^{M} (|R_t| / \mathrm{Price}_t \times Volume_t) \quad (3)$$

### 2.2.3 Liu (2006) measure

This follows Liu (2006) and is defined as $LM_x$ which is the standardized turnover-adjusted number of zero daily trading volumes over the prior x months (x = 1, 6, 12), that is:

$$LM_x = (\text{Number of daily volumes in prior x - months}) + \left(\frac{1/x \text{ month turnover}}{Deflator}\right) \times (21x/NoTD) \quad (4)$$

where "x month turnover" is the turnover over the prior x months, calculated as the sum of the daily turnover over the prior x months, daily turnover is the ratio of the number of shares traded on a day to the number of shares outstanding at the end of the day, "NoTD" is the total number of trading days in the market over the prior x months, and Deflator is chosen such that,

$$0 < \frac{1/(x \text{ month turnover})}{Deflator} < 1 \quad (5)$$

for all sample stocks[1]. Given the turnover adjustment (the second term in brackets in (5)), two stocks with the same integer number of zero daily trading volumes can be distinguished: the one with the larger turnover is more liquid. Thus the turnover adjustment acts as a tie-breaker when sorting stocks based on the number of zero daily trading volumes over the prior x months. Because the number of trading days can vary from 15 to 23, multiplication by the factor (21x/ NoTD) standardizes the number of trading days in a month to 21, which makes

[1] In line with Liu (2006) a deflator of 11,000 is used in constructing estimates for LM1

the liquidity measure comparable over time. LM1 can be interpreted as the turnover-adjusted number of zero daily trading volumes over the prior month. The liquidity measure, $LM_x$ is calculated at the end of each month for each individual stock based on daily data.

### 2.2.4 Turnover

The turnover measure is defined as follows:

$$1 \Big/ D_M \sum_{t=1}^{M} (volume_t / \text{shares - outstanding}) \qquad (6)$$

where $D_M$ is the number of days in the month, M. It should be noted that there is considerable variation on both a inter as well as intra-market basis and that any turnover statistics that exceed 100% of the shares outstanding in any month are removed. The shares-outstanding is determined at the start of the year and remains constant for the 12 months thereafter.

## 2.2 The North African business environment

The North African (Maghreb) informal institutional environment is overwhelmingly dominated by classical Islamic shari'ya law (Kuran (2004, 2005)) with partnership being the central commercial form together with strong emphasis on extended family values both in terms of morality as well as to mitigate often very high transactions costs (Hearn, 2011). However despite underlying notions of Islamic social justice, partnerships as a commercial form are limited in duration owing to their dissolution upon death of one of founding partners. Equally the emphasis on risk-sharing amongst even latent partners infers prohibitively high monitoring costs which effectively inhibits the pooling of risks across investors leading to the pooling and mobilization of savings necessary in financial intermediation (Kuran, 2004). As a consequence of the need to retain competitiveness in lucrative trans-Mediterranean trade routes, French civil code law political, governmental and legal institutions were transplanted

in Egypt and Tunisia, while colonial conquest inferred the wholesale adoption of these institutions in Algeria and Morocco. These transplanted formal institutions introduced new limited liability contracts to the Maghreb region's business environment while the French civil law system of governance underscored a centralised legal system reinforced by a polity dominated by social elites (La Porta et al, 1998, 2000). While the centralised promotion of state organs, dominated by social elites, is promoted in French civil code law, the role of the state is further emphasised through the adoption of credit mutual organizations to assist in the state's strategic provision of credit, similar to that undertaken in France itself. These are particularly prevalent in Morocco, Algeria and Tunisia. However the very nature of the narrow political economies and their domination by social elites, reinforced by legal systems engendering the centralised role of state in economic affairs, across North Africa infers less recognition and protection of minority investor property rights reflected in substantial transactions costs. As a consequence the formation of extended business networks centred on families is a natural result arising from superior coordination and allocation efficiencies between group members thereby mitigating the prohibitively high transactions costs that would arise from external contracting. As such individual families alongside extended family and business networks dominate the Maghreb business environment in addition to more recent privatization initiatives relating to the restructuring and sale of cumbersome former state owned enterprises.

A significant drawback in prior liquidity studies, such as Lesmond (2005), is the omission from consideration of the impact on liquidity arising from these powerful alternative governance mechanisms such as family, business networks and state as well as the effects arising from the signalling of value of incumbent firms by early-stage investors such as foreign and domestic venture capitalists. Consequently I introduce seven controls that take value 1 if condition is satisfied and 0 otherwise for the involvement of state, presence of a long term foreign partner, which is a prevalent feature in gradual part-privatization processes

(Perotti, 1995), entrepreneurial owner-founder retaining leadership role on board, whether firm is dominated by single family or is part of an extended family/business network and then whether domestic or foreign venture capital firms are involved as early-stage investors. The differentiation between single family and extended family/business network is justified from recent literature regarding differences in levels of altruism displayed within families embedded within firms. Lubatkin et al (2007) outlines a typology of five types of altruism in family firms with only some of these having positive connotations for external minority investors. Furthermore a large literature centred on Claessens et al (1999, 2000) argues that the separation of ownership from control, primarily through pyramidal structures, cross-shareholdings and multiple share voting structures infers considerable potential for expropriation of minority outsider shareholders. As such I differentiate between firms that are owned and controlled by a single cohesive family unit and large extended business networks of firms. As such two additional control variables are included to account for the extended business networks of the ruling and former ruling family's in Tunisia and Morocco, namely Ben Ali and SNI, the investment vehicle of Moroccan royal family. The complexity involved in tracing often disparate firms that share a common bond through being constituents to a larger business group is demonstrated in Figure 1. This reveals the extensive nature of Morocco's SNI business group that permeates throughout the national economy and underscores the ubiquitous nature of business groups with SNI alone accounting for over 12% of listed firms on national Moroccan exchange. Finally all controls were formed from study of individual firm's ownership and board structure, which has been translated from Arabic to English available from Mubasher.info website for all listed firms from across Middle East region.

**Figure 1**

### 2.3 Maghreb equity markets

North Africa's stock markets are generally well organized with separate listings compartments to support the listing and trading of corporate and government debt as well as a variety of classes of equity. Trading systems are also generally sophisticated, adopting the latest advances in market microstructural optimization, such as adopting pre-opening and pre-close auctions into continuous systems, and are often adapted from proven technology in leading overseas exchanges, such as the adoption of Euronext ATOS platform in both Tunisia and Morocco (see Appendix 1). Furthermore once adopted these systems are adapted for implementation into the business environment within which the exchanges are embedded. This is reflected in the parallel maintenance of continuous and auction-based trading systems in Tunisia and Morocco, where individual stocks liquidity differentiates upon which system it is traded, with liquidity being determined according to a centrally controlled algorithm. Large institutional orders for stock that have irregular frequency are transacted through a designated block trade market (Marché de blocs) via over-the-counter trading in the case of Morocco (see Ghysels and Cherkaoui (2003) for discussion). Similar consideration of business, trading and market microstructural environment has led to the adoption of simple electronic call auction for retail orders and separately for block-orders on Mondays and Wednesdays in the Algerian bourse where there is little demand for external stock market finance owing to a dominant banking sector and prevalence of internal sources of capital. It is also notable that this environmental ambivalence towards stock market external finance has caused the Tunisian and Moroccan bourses to operate schemes of extensive corporate tax breaks in order to attract new listings. All exchanges have a centralised electronic book entry system and order matching is prioritised in accordance to price (first) and time of receipt (second). Equally all exchanges have relatively homogenous trading hours, albeit with the sole exception of the fledgling Algerian auction market where trading only occurs on Monday and Wednesday. The Egyptian equity market is by far the largest in the region with the exchange supporting 21 subsidiary trading boards, including the prestigious main board alongside Nilex SME board

and a variety of OTC boards. These latter OTC boards are notable inasmuch that they sustain the infrequent trading of firms that have been delisted (also termed as unlisted) from main boards owing to the progressive implementation and adoption of onerous (and costly) accounting and disclosure regulations, causing formal listings to shrink from a figure of approximately 800 in 2002 to a current 256 firms.

However while many of the differences in secondary market trading systems across North African markets are a function of the size and activity of market in relation to wider economy, a more fundamental source of intra-market segmentation arises from the regulatory provisions of various listings compartments within the exchanges (see Appendix Table 2). Algeria being by far the smallest market, with only 4 listings, has a single equity listing compartment, Le Compartment des Actions, while the Moroccan and Tunisian exchanges have adopted a more differentiated marketplace. The Moroccan bourse has three listings tiers: the main board, Marché Principal, the SME development board, Marché Développement, and finally a third segment aimed at small but very high growth firms, Marché Croissance. Each listing segment differs substantially in terms of financial reporting standards, minimum sales requirements for firms intending to list, and minimum amounts of shares to be issued, as detailed in Appendix Table 2. The Tunisian exchange has two compartments: the main board, Marché Principal, and SME development board, Le Marché Alternatif. All firms across the three Algerian. Moroccan and Tunisian markets are classified by the exchanges in terms of their respective listings compartments which form an obvious boundary for the segmentation within these markets. This classification justifies my use of this system in studying the efficacy of liquidity measures within each listing category. However the very large scale of the Egyptian equity market with multiple listings compartments is complimented by less of an emphasis in Egypt on firms categorized by their listings compartment but rather in accordance to their being constituents to a range of bespoke internationally recognized indices, such as the EGX30. This is in line with evidence that the Egyptian market is recipient to significant

overseas institutional investment (see Hearn, 2010, 2011). Consequently this justifies the focus of study into the efficacy of liquidity measures on firms constituent to the prestigious EGX30 index and then those listed on main board but falling outside of this benchmark. A final segment considered in Egypt is that of the small SME market, Nilex board.

### 2.4 Political risk determinants of liquidity

In order to investigate the impact of political institutional quality on liquidity I use the political institutional risk indices that are themselves sub-components of the aggregate political risk index used in forming the International Country Risk Guide (ICRG) rating for countries (PRS Group website, 2012). A key benefit from using ICRG political risk measures is that these are reported on a monthly basis as opposed to the annual basis common to majority of institutional quality indices which is beneficial owing to the smaller time periods involved in study of North African markets. Equally the use of law and order measure of judicial efficiency follows from Lesmond (2005). I use seven ICRG political risk measures, namely investment profile and government stability, with both rated on scale 0 to 12, corruption, socio-economic conditions, military in politics, democratic accountability and law and order, all rated on scale 0 to 6[2]. These measures have been selected over other ICRG political risk indicators owing to their applicability to North African region, where external conflict is rare and religious and ethnic tensions are not significant owing to general homogeneity of societies and dominance of Islam as religion. As such these provide a largely unique and comprehensive insight into the impact of political institutions and risks on liquidity.

[2] Monthly time series estimates are provided by PRS Group Inc. (www.prsgroup.com) for all four North African countries included in study. The overall ICRG political risk measure is an amalgamation of 12 sub-component indices and ranges from 0 to 100. Each of the individual sub-component political risk measures, as used in this study, are rated on scale of either 0 to 12 or 0 to 6 with lower values being associated to greater risk. However owing to potential correlation between measures (see Lesmond (2005) for detail) each measure is recursively included in models.

## 3. DATA

### 3.1 Maghreb (North African) business environment

A significant observation from the evidence in Table 1 is the extensive prevalence of extended family networks and business groups where these are particularly common in Morocco and Tunisia. In contrast state activity in both markets is generally confined to the main boards while a nuance of the Moroccan market arises from high concentration of state participation in the high growth market (Marché Croissance) where this routinely takes the form of the extended networks of state private investment agencies such as CDG. Similarly in Egypt the constituent firms of the top tier blue chip EGX30 index have high degree of extended family group/network affiliation which dissipates rapidly across the lower tiers of the Egyptian market (specifically across the firms constituent to main board that are not constituent to EGX30) and the fledgling small and medium enterprise (SME) development board, Nilex. Generally the involvement of foreign partners is largely confined to top tier blue chip firms constituent to main boards. There is a similar concentration of foreign venture capital involvement in top tier blue chip firms with much less involvement in smaller and more riskier firms in SME boards or constituent to the main board outside of the top tier prestigious indices, while the opposite is true of domestic venture capital with this being more concentrated in these lesser well known firms. Algeria being a fledgling stock market in an economy overwhelmingly dominated by banking system and state provision of credit is notable in having a high proportion of listings arising from state privatizations.

There is considerable dispersion in political institutional quality across the Maghreb region with Morocco generally being associated with the least risk across all measures and Egypt being susceptible to the highest levels of political risk. However Algeria has the lowest measure associated with corruption – indicating the greatest risk associated with this indicator. It is notable that the greatest risk associated with military involvement in politics is in Egypt which is almost twice as high as Morocco and Tunisia in contrast.

**Table 1**

### 3.2 Data and impact of Arab Spring

Some general observations can be made about the data in Table 2[3]. The first is that bid-ask spread measure of illiquidity as well as the price-rigidity proportion of zero returns measures increased substantially in the sample period following the onset of the Arab Spring, defined as January 2011 onwards, in Egypt and Morocco, whilst the opposite is true in the case of Tunisia where there is increased liquidity and markedly less rigidity in stock price returns. This may be a reflection of the minimal and largely peripheral role of the stock market in business financing in Tunisia (Zribi, 2008). However in the case of Egypt and Morocco there are considerable increases in the relative elevation of illiquidity and price rigidity following the onset of Arab Spring in the lesser listings boards, i.e. in Marché Développement and Marché Croissance in Morocco which may reveal the impact of equity market capital rationing. This would infer that the least well regulated markets, that have watered down regulation to attract SME firms and facilitate grass roots private sector investment, and more susceptible to political uncertainties than their more well regulated main board counterparts. A final observation across the sample market listings boards confirms that the less well regulated listings boards, such as Marché Développement and Marché Croissance in Morocco or EGX30 constituents as opposed to main board firms not constituent to this index in Egypt, have lower trading volumes and lower market capitalizations than their top tier blue chip main board counterparts.

**Table 2**

[3] Spearman's rank correlations between Stoll market controls and five liquidity measures, including bid-ask spread, for every equity market listing segment across North Africa. These have been undertaken on overall sample as well as sub-samples for per and post Arab Spring periods respectively. These reveal a general increase in size of correlations with all other variables associated with price and volume in post Arab Spring period in contrast to period pre-Arab Spring. These are available from author upon request.

Further evidence of the impact of the Arab Spring period of social upheaval can be seen from Figures 2 to 5. These contrast the time series evolution of monthly average of daily traded volumes, monthly average of daily proportion of zero returns, and bid-ask spreads across a time span of January 2002 to June 2012 for Algeria (Figure 2), Tunisia (Figure 3) and Egypt (Figure 5), while data corresponding to a shorter time frame of January 2009 to June 2012 is available for Morocco (Figure 4). While it should be noted that there are sharp increases in severe illiquidity between both Egypt and Tunisia for January 2011 to March 2011, corresponding to the onset of Arab Spring, in contrast the large increase in trading activity in Algeria is more likely attributable to the late 2010 listing of its fourth firm, Alliance Assurances, which is the first private sector listing in the country. The evidence from Figure 4 would reveal that the Moroccan bourse was largely unscathed by political upheavals in its neighbours, Egypt and Tunisia.

**Figures 2 - 5**

## 4. ESTIMATION

### 4.1 Relationship between liquidity measures and bid-ask spread plus commission costs

**An assessment of liquidity measures ability in explaining total costs**

To determine this relationship a number of regression models are estimated using OLS. For each of the markets a single regression is estimated where the endogenous variable is the bid-ask spread plus commission as described in Appendix Table 1. The regressors are the three liquidity measures introduced first individually and then all together. Seven governance related controls are introduced, where these are involvement of state, foreign partner, entrepreneurial-founder on board, individual family, extended family/business group and then domestic as opposed to foreign venture capital. In the case of Tunisia and Morocco a further governance dummy was introduced accounting for impact of single investment entity (business group) associated with ruling family, Ben-Ali in Tunisia and SNI (royal family) in

Morocco. A final dummy was also included in Tunisia to account for the fledgling SME board, where with 4 listed firms and only a very recent inception reducing the historical time series, was a dummy to account for this alternative board necessitated. However only in Egypt is the development board administered by a company, Nilex, that is separate from the main Egyptian exchange itself. Finally four additional variables are included to control for daily stock returns volatility, the mean of the daily price for one month, traded volume and market capitalization, with the latter three in natural logarithms, following Stoll (2000). Price proxies for discreteness (Harris, 1994), risk and bid-ask spread (Benston and Hagerman, 1974), while volume indicates market depth (Pagano, 1989) and market capitalization is commonly reflected in bid-ask spreads (Stoll and Whaley, 1983). Volatility is closely tied to liquidity as thin, speculative markets tend to more volatile than their deep counterparts (Cohen et al, 1976). Owing to persistence in liquidity measures over time (see Petersen (2009) for an extended discussion) I have estimated the standard errors by clustering them on time dimensions using White cross section robust standard errors and covariances method. This ensures that inferences, based on standard errors, is robust to correlation across residuals within a firm over time[4].

**Direct model comparisons: Vuong likelihood ratio test**

A useful likelihood ratio test for model selection in the absence of specifying a null hypothesis that either model is true is outlined in Vuong (1989) and applied in a similar context by Lesmond (2005). A detailed mathematical exposition is outlined in the appendix of Lesmond (2005)[5]. This tests the null hypothesis that either model is equally as good at explaining the underlying data generating process for liquidity with an alternate hypothesis that one is better than the other. The likelihood ratio Z-score test statistic indicates whether

[4] White cross section robust standard errors and covariances method has been used in all estimations to account for period clustering over time for either firms or countries/markets
[5] This exposition is also available from author upon request

the reference model is better at explaining the comparison model with a one-sided probability. The reference models in this case are either the turnover or Liu liquidity measures, and the comparison models are a group of "controls" resulting from combination of Stoll (2000) variables and the six firm governance measures, and then the zero daily returns and the Liu measure. The zero daily returns is a comparison model in the Liu reference model tests. A positive and significant one-sided probability indicates that the turnover or Liu measure is statistically superior to the competing liquidity measures. Lesmond (2005) asserts that a positive sign for the Z-score test statistic indicates the reference model has a higher $R^2$ regression statistic than the competing models. However given the significance of the political and institutional upheaval and changes during the course of the Arab Spring and their likely impact on wider transactions costs, Vuong tests were undertaken on sample pre and post onset of the Arab Spring.

### 4.3 The institutional determinants of liquidity

Finally, assuming a lack of variation in institutions within countries, random effects were applied as this specification adjusts the variance for country-level cross-correlation due to common omitted factors within each country, following Lesmond (2005). This is preferred to a fixed effects regression because of the lack of variation for the institutional variables within each country. This is a particularly strong issue in North African environment as all countries extensively adopted (transplanted) Napoleonic French civil code formal institutions (legal, governmental, judicial, political) and while Egypt nominally adopted English language upon its incorporation into British Empire it retained its former civil code formal institutions (Hearn, 2011). Consequently there is marked similarity in institutions and institutional development across the Maghreb region. Following from the preceding arguments of institutional change across North African countries in period following the ongoing Arab Spring political

upheaval and likely impact on transactions costs across environment, I perform random effects tests on sample pre and then post Arab Spring.

## 5. RESULTS AND DISCUSSION

### 5.1 Relationship between liquidity measures and bid-ask spread plus commission costs

**An assessment of liquidity measures ability in explaining total costs**

All models were estimated with dependent variables being both the total trading costs (bid-ask spread plus commissions) as well as bid-ask spread on its own for robustness. The results in both cases are very similar. However in keeping with the background literature (Lesmond, 2005) I report the results for total trading costs here. As such the evidence in Table 3 reveals that across all Moroccan listing compartments (and models) there is a large positive and highly statistically significant association between both the simple proportion of zero returns measure and the volume-based turnover construct with bid-ask spread plus commission (total trading costs measure). The coefficients of association between price-impact construct of Amihud and multidimensional measure of Liu with total trading costs dependent variable are small in size and while tending to be marginally statistically significant (at 90% confidence level) when added into models recursively (individually) lose this significance in the grand regressions including all liquidity (illiquidity) measures together. A similar pattern is visible across all Tunisian models with the additional strength and statistical significance of association between Amihud measure and total trading costs. However in this case it is notable that the coefficient of association of both Amihud measure and proportion of zero returns construct are extremely small in size. Finally there are sharp differences revealed between Egyptian EGX30 constituents, remainder of Egyptian main board and Nilex SME market in terms of associations between liquidity (illiquidity) measures and total trading costs. Turnover and Liu constructs have large, positive and statistically significant associations with dependent variable across EGX30 constituents while a similarly significant association

between proportion of zero returns is reduced in effectiveness by its very small size. The volume-based turnover measure has an equally sizeable and significant association with dependent variable across the stocks forming the remainder of Egyptian main board outside of the EGX30. However while there are additional significant associations between dependent variable and both Liu and Amihud constructs, these are reduced in effectiveness by their very small size. Finally the only measure with persistent statistical significance in its association with total trading costs dependent variable in Egypt's Nilex SME market is that of the proportion of zero returns. Overall the evidence suggests that the simple price-rigidity proportion of zero returns and volume-based turnover constructs have stronger association with total trading costs than either the Amihud or Liu measures.

The evidence from across all markets reveals that the Arab Spring has had a marked impact on levels of illiquidity across North Africa's equity markets, although this is greatest in Morocco and Egypt and lacking statistical significance in Tunisia. In particular the effect increases in accordance to increasingly weak regulation, with the Arab Spring being associated with a 0.3%-0.4% level of transactions costs measured by total trading costs (bid-ask spread plus brokerage commissions) for the Moroccan main board (Marché Principal ) which increases to 0.8% for Morocco's Marché Développement and ultimately to 1.6% in Morocco's Marché Croissance. Similarly transactions costs as measured by total trading costs associated with Arab Spring are 1.7%-1.9% across the constituents of Egypt's EGX30 index, before rising to 2.3% across remainder of main board, before rising again to between 4.3% and 4.8% in Nilex. These findings are in line with earlier evidence indicating equity capital rationing has likely resulted from the Arab Spring inferring that private sector development reforms across North Africa are likely to be hindered by a lack of available equity capital for SME firms. Equity capital rationing being defined as being very similar to credit market rationing where prohibitively high costs of equity capital inhibit firms from effectively being able to obtain finance from public stock markets.

In terms of both firm governance and market controls and there are some notable observations across all market listings segments (between Morocco, Tunisia and Egypt) that reflect in the very different nature of transactions costs within each of these listing compartments or segments. Generally across the market segments with highest levels of regulation, namely the top tier main boards in Morocco and Tunisia as well as EGX30 constituent firms, there is a negative association between state and foreign partner involvement and illiquidity, or total trading costs. This changes to a large, positive and statistically significant relationship in market segments with weaker regulation such as Marché Développement and Marché Croissance in Morocco as well as Egyptian main board stocks that are not constituent to EGX30. There is a notable negative and statistically significant association between entrepreneurial firms (owner-founder on board) and total trading costs (illiquidity) across all markets providing some evidence of longer term investment horizons associated with firm's retaining entrepreneurs. Equally across all markets the extended family groups and business networks have a stronger negative association with total trading costs (illiquidity) than their single family counterparts reflecting the differences in altruistic behaviour of these entities and the enhanced separation of ownership from control. However there are some differences with single family entities being associated with greater illiquidity across all Egyptian firms while extended family/ business networks are negatively associated with illiquidity across EGX30 constituent firms and positively associated with illiquidity across the remaining Egyptian main board firms (outside of EGX30). The impact of extended family business networks on total trading costs (illiquidity) is further revealed in Morocco and Tunisia through specially constructed control representing the Moroccan royal families exclusive holding company, SNI, and Tunisia's Ben Ali family's extended network. These both have a negative association with total trading costs (illiquidity) to a similar degree as the generic control for extended family business networks across the highest regulated main boards of Morocco and Tunisia. However in the

least well regulated and high growth Marché Croissance, in Morocco, the association is large and positive, in contrast to the large negative association with the generic control for extended family networks. This would infer that transactions costs are higher, which is likely a function of increased risk of expropriation, in less well regulated markets where there is a less onerous regulatory burden on firms to disclose sensitive corporate information. This would indicate that the extended business networks of social elites across North Africa have the propensity to expropriate only when regulation is sufficiently weak thereby increasing the motivation to expropriate from minority outside investors with relative impunity (Claessens et al, 1999). Finally the evidence across all markets reveals that there is a greater negative association between foreign venture capitalist involvement and total trading costs (illiquidity) than that of their domestic counterparts.

The relationships across the Stoll market controls are largely as intuitively expected and similar to those reported in Lesmond (2005). Stock price is generally negatively associated with total trading costs (illiquidity) as is traded volume while there is a positive association between volatility. The association between market capitalization and total trading costs is more mixed with a combination of both positive and negative coefficients which is similar to results reported in Lesmond (2005) as well as within the Sub Saharan African context in Hearn and Piesse (2012a, b) and Hearn (2013) in West Africa.

**Table 3**

**Contrasting the liquidity measures: Vuong likelihood ratio test**

The Vuong (1989) maximum likelihood tests are in Table 4 and examine the rejection of the Stoll (2000) variables or the competing liquidity constructs in favour of the three reference measures, that is proportion of daily zero returns, turnover and Liu (2006). These were performed on sample both pre and post Arab Spring.

These results reveal that the greatest changes in transactions costs are in Egypt and the Moroccan main board. In particular the positive and statistically significant coefficient for both Amihud as well as turnover versus the proportion of zero returns construct in pre-Arab Spring sample indicates that the proportion of zero returns had higher explanatory power of the bid-ask spread than competing Amihud or turnover constructs. This infers that price-rigidity had a more prominent role in explaining bid-ask spread in stocks constituent to the Egyptian EGX30 index than rival volume-based measures of transactions costs. However the change in direction of both coefficients in post-Arab Spring sample underscores the changes in transactions costs in the Egyptian business environment where volume-based measures have a more prominent role. This is further exemplified by the positive and highly statistically significant coefficients in Amihud versus turnover in the context of Egyptian main board stocks (outside of EGX30) and Egyptian main board overall where post-Arab Spring volume-based measures of turnover better explain bid-ask spreads. Equally the positive and statistically significant coefficients in Liu versus proportion of zero returns for Egyptians main board (outside EGX30) and overall main board (including EGX30 stocks) in pre-Arab Spring sample reveals price-rigidity is superior in explaining bid-ask spread than multidimensional Liu indicator. However the reversal in direction (to negative) of both coefficients post-Arab Spring infers that price-rigidity is less of a dominant issue in measurement of transactions costs in period following Arab Spring in the lower levels of the Egyptian main board and the Nilex SME market. In contrast to the lower tiers of the Egyptian market, the evidence from the positive and statistically significant coefficients for Liu versus Stoll controls, proportion of zero returns, and comparative group of liquidity measures, indicates the relative weakness of this multidimensional construct in contrast to alternative measures and in particular the proportion of zero returns for the constituent stocks of EGX30. As such this would infer some support for increased importance of price-rigidity in

determining illiquidity in top tier EGX30 constituents post Arab Spring while this has less of a role in explaining illiquidity in the lower levels of Egyptian market.

**Table 4**

### 5.2 The determinants of liquidity: political institutions

The results of random effects regressions through the recursive addition of each of seven ICRG political institutional risk measures in addition to market controls in terms of explaining bid-ask spread illiquidity are outlined in Table 5. In general the results are in line with preceding findings in Lesmond (2005) where an inverse relationship between institutional quality (judicial quality and political risk) and liquidity was reported. However there are some notable differences in the pre and post-Arab Spring sub samples. In particular there is a change of direction (sign) in relationship between democratic accountability institutional measure and liquidity. In the pre-Arab Spring sample this is positive and statistically significant at 90% while this relationship is almost exactly reversed in the post-Arab Spring sample, where coefficient is same size but negative and statistically significant. Following the arguments of Lesmond (2005) more autocratic governments, dominated by handfuls of social elites with considerable vested state level private benefits of control, are less likely to relinquish these in order to implement policies that would enhance liquidity and protect minority investors. Thus under these circumstances (pre-Arab Spring) enhanced democratic accountability will likely lead to weaker centralized authority and inability to implement liquidity enhancing policies. However following the onset of the Arab Spring and substantial political upheavals, newly formed reformist and popularist governments (as opposed to their autocratic pre-Arab Spring counterparts) are likely to be less dominated by social elites and their private interests. Thus they are likely both more susceptible to enhanced democratic accountability but also in being better able to enact policy measures to protect minority investors and enhance liquidity. Further justification of these arguments regarding the

democratic accountability and type of government (autocratic and controlled by handful of social elites as opposed to popularist) and impact on liquidity is also in the attenuation of statistical significance for the negative coefficients between bid-ask spread and both "military in politics" and "government stability" institutional quality measures. Both coefficients attained statistical significance of 99-95% and 90% respectively in post-Arab Spring sample from a lack of any significance in pre-Arab Spring sample. Similar results are obtained from random effects models using Liu, Amihud, turnover and proportion of zero daily returns measures as dependent variable which are not reported[6].

**Table 5**

## 6. CONCLUSIONS

This paper contrasts four illiquidity (liquidity) measures, namely proportion of zero daily returns, Amihud (2002), Liu (2006) and turnover constructs in their ability to explain bid-ask spread plus brokerage commissions across listings segments in Morocco, Tunisia, Algeria and Egypt. A unique aspect to this study is the splitting of sample into pre Arab Spring and post-Arab Spring and the use of seven well established ICRG political institutional risk measures alongside a further seven firm governance controls that take account of dominant governance structures prevalent in Maghreb business environment.

I find evidence supporting assertion that equity capital rationing has taken place over the Arab Spring inferring that illiquidity levels attributable to the Arab Spring are higher in market segments with weaker regulation, such as SME and high growth boards. This is likely to hinder political reforms designed to engender private sector growth. Furthermore I find that firms falling within extended family business networks have lower levels of illiquidity than firms dominated by a single family entity. However firms belonging to the extended network of SNI, representing the Moroccan royal family, are likely to have lower illiquidity in

[6] Results are available from author upon request and are omitted due to brevity considerations

the better regulated main board while their counterparts will have elevated illiquidity in the much smaller high growth market where information disclosure is less onerous. This would infer that the likelihood of potential expropriation is greatest within large extended networks where incumbent firms are in less visible and well regulated areas of economy leading to elevated illiquidity.

Finally I find marked differences in political institutional risk determinants pre and post Arab Spring across bid-ask spread, proportion of zero daily returns, turnover and Liu transactions costs measures. In particular illiquidity transcending Arab Spring period is closely associated with corruption, risks of military involvement in politics, democratic accountability and law and order measures. These are largely reflective of the changes to political economies having been initiated during Arab Spring with greater emphasis on universal suffrage and reduction in domination of polity by social elites with substantial private benefits of control.

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**Table 1. Sample descriptive statistics**

Table contrasting average firm governance characteristics across all listed firms from every stock market in SSA region against six institutional quality measures. The firm governance measures are dummy variables taking value 1 if condition is satisfied and 0 otherwise for involvement of state, foreign partner, entrepreneurial founder retained on board, whether firm is part of extended family group/ business network and whether domestic as opposed to foreign venture capitalists (VC) participate in ownership and organizational structure. These controls are sourced from financial reporting service Mubasher.net as well as websites of individual firms, stock exchanges and national regulatory authorities. Dummy variables are formed from each year of listing for each firm. The average values are presented for each of the six political institutional risk indices (developed by PRS Group and ICRG) across all markets. Ratings scales are provided for each measure, where lower values indicate greater risks attributed to that measure.

| **Market** | **Proportions of listed firms with involvement of following entities** | | | | | | | | **Political Institutional measures** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **N** | State | Foreign Partner | Owner/ Founder | Single Family | Family/ Bus. Group | VC Domestic | VC Foreign | Corrupt | Invest. Profile | Gov. Stability | Socio Econ Cond. | Military in Politics | Democrat. Account | Law & Order |
| | | % | % | % | % | % | % | % | 0 - 6 | 0 - 12 | 0 - 12 | 0 - 12 | 0 - 6 | 0 - 6 | 0 - 6 |
| **Algeria** | 4 | 75.00 | 0.00 | 0.00 | 0.00 | 25.00 | 0.00 | 0.00 | 1.83 | 7.71 | 8.32 | 5.00 | 3.00 | 3.54 | 3.00 |
| **Morocco** | | | | | | | | | | | | | | | |
| Marché Principal | 42 | 21.43 | 38.10 | 7.14 | 14.29 | 69.05 | 26.19 | 14.29 | 2.95 | 9.21 | 8.19 | 6.50 | 4.00 | 4.56 | 4.95 |
| Marché Développement | 16 | 6.25 | 6.25 | 12.50 | 37.50 | 50.00 | 6.25 | 0.00 | 2.95 | 9.21 | 8.19 | 6.50 | 4.00 | 4.56 | 4.95 |
| Marché Croissance | 18 | 11.11 | 33.33 | 5.56 | 33.33 | 33.33 | 5.56 | 11.11 | 2.95 | 9.21 | 8.19 | 6.50 | 4.00 | 4.56 | 4.95 |
| Morocco: Overall | 76 | 15.79 | 30.26 | 7.89 | 23.68 | 56.58 | 17.11 | 10.53 | 2.95 | 9.21 | 8.19 | 6.50 | 4.00 | 4.56 | 4.95 |
| **Tunisia** | | | | | | | | | | | | | | | |
| Marché Principal | 58 | 29.31 | 25.86 | 3.45 | 13.79 | 51.72 | 10.34 | 6.90 | 2.52 | 7.98 | 9.30 | 5.81 | 3.88 | 2.00 | 4.88 |
| Le Marché Alternatif | 4 | 25.00 | 25.00 | 50.00 | 25.00 | 50.00 | 50.00 | 0.00 | 2.52 | 7.98 | 9.30 | 5.81 | 3.88 | 2.00 | 4.88 |
| Tunisia: Overall | 62 | 29.03 | 25.81 | 6.45 | 14.52 | 51.61 | 12.90 | 6.45 | 2.52 | 7.98 | 9.30 | 5.81 | 3.88 | 2.00 | 4.88 |
| **Egypt** | | | | | | | | | | | | | | | |
| EGX30 | 30 | 13.33 | 13.33 | 23.33 | 20.00 | 53.33 | 10.00 | 10.00 | 2.00 | 6.31 | 7.29 | 4.94 | 2.39 | 1.77 | 3.30 |
| Main (excl. EGX30) | 195 | 35.29 | 17.11 | 6.42 | 8.56 | 30.48 | 15.51 | 5.35 | 2.00 | 6.31 | 7.29 | 4.94 | 2.39 | 1.77 | 3.30 |
| Egypt: Main Overall | 225 | 32.26 | 16.59 | 8.76 | 10.14 | 33.64 | 14.75 | 5.99 | 2.00 | 6.31 | 7.29 | 4.94 | 2.39 | 1.77 | 3.30 |
| Egypt: Nilex | 20 | 5.56 | 0.00 | 16.67 | 33.33 | 16.67 | 5.56 | 0.00 | 2.00 | 6.18 | 6.46 | 4.96 | 1.98 | 1.62 | 3.16 |

Source: Compiled by author from national stock exchanges and Bloomberg. Institutional measures obtained direct from PRS website: http://www.prsgroup.com/countrydata.aspx

**Table 2. North African equity market summary statistics**

Comprehensive descriptive statistics for 20 SSA equity markets including 12 that are included in final sample. Start dates vary for each country while sample end dates are June 2012 across all markets. N refers to sample size, or number of stocks included. Price is the average of daily prices over each month and is converted to US$ using the average exchange rate for each month and country to facilitate comparison. Volume is the average of the daily trading volume over each month and is stated in thousands. Market capitalization is measured as of 1 January for each country and is equity market value for each firm expressed in millions of local currency or US$. The bid-ask spread is generated through $Quoted\ spread_M = 1/2\left[\left(\frac{(Ask_M - Bid_M)}{(Ask_M + Bid_M)/2}\right) + \left(\frac{(Ask_{M-1} - Bid_{M-1})}{(Ask_{M-1} + Bid_{M-1})/2}\right)\right]$ applied to respective monthly bid and ask prices for individual stocks. The monthly average is taken across all stocks to obtain a market wide measure. The monthly average is taken across all stocks to obtain a market wide measure. The US$ market capitalization is derived using the end of month exchange rate for each country and month. Square parentheses indicate median values for each variable.

| | | | **Local market** | | | | **US$ equivalent** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Pre-Arab Spring | | Post-Arab Spring | | Overall sample | | |
| Country | Sample Start | N | Bid-Ask spread (%) | Zero Return (%) | Bid-Ask spread (%) | Zero Return (%) | Volume (shares, m) | Price | Mkt. Cap (b) |
| **Algeria** | 01/2000 | 4 | -- -- | 96.40 [96.77] | -- -- | 97.90 [100.00] | 0.003 [0.001] | 8.26 [5.90] | 0.054 [0.050] |
| **Morocco** | | | | | | | | | |
| Marché Principal | 01/2009 | 42 | 2.13 [1.67] | 51.22 [45.16] | 2.85 [2.48] | 52.11 [48.33] | 0.322 [0.023] | 91.56 [58.15] | 1.438 [0.499] |
| Marché Développement | 01/2009 | 16 | 3.76 [2.99] | 63.05 [64.52] | 5.12 [4.68] | 67.19 [70.97] | 0.021 [0.003] | 82.78 [62.28] | 0.128 [0.063] |
| Marché Croissance | 01/2009 | 18 | 4.73 [3.89] | 72.72 [77.42] | 7.10 [5.97] | 77.75 [82.50] | 0.004 [0.001] | 70.47 [46.12] | 0.034 [0.027] |
| Overall | 01/2009 | 76 | 3.06 [2.41] | 57.22 [53.33] | 4.28 [3.51] | 61.18 [57.60] | 0.009 [0.002] | 33.10 [34.69] | 0.017 [0.016] |
| **Tunisia** | | | | | | | | | |
| Marché Principal | 08/2000 | 58 | 2.28 [1.04] | 52.38 [46.67] | 2.09 [1.19] | 53.97 [46.67] | 0.226 [0.078] | 18.38 [7.27] | 0.166 [0.066] |
| Le Marché Alternatif | 01/2009 | 4 | 3.32 [3.15] | 66.37 [71.16] | 1.79 [1.42] | 48.78 [46.61] | 1.408 [0.045] | 4.87 [4.94] | 0.073 [0.014] |
| Overall | 08/2000 | 62 | 2.68 [1.79] | 65.20 [64.52] | 2.07 [1.26] | 53.68 [45.79] | 0.317 [0.081] | 17.74 [7.19] | 0.163 [0.065] |
| **Egypt** | | | | | | | | | |
| EGX30 | 02/2002 | 30 | 1.77 [0.82] | 45.01 [35.48] | 4.13 [2.78] | 44.27 [36.08] | 37.457 [13.258] | 3.94 [1.57] | 1.271 [0.695] |
| Main Market (excl. EGX30) | 02/2002 | 195 | 6.60 [2.35] | 62.66 [61.29] | 9.84 [5.99] | 55.20 [38.71] | 4.763 [0.282] | 7.50 [2.19] | 0.179 [0.043] |
| Main Market Overall | 02/2002 | 225 | 5.98 [2.02] | 60.59 [51.61] | 9.04 [5.56] | 53.75 [38.71] | 9.161 [0.549] | 7.07 [2.19] | 0.313 [0.054] |
| Nilex | 06/2010 | 20 | 13.51 [12.31] | 75.84 [85.19] | 10.36 [10.05] | 81.44 [91.02] | 1.719 [0.112] | 3.83 [1.97] | 0.015 [0.011] |

Source: Compiled by author from Bloomberg, Datastream and National stock exchanges

Notes: (1) US$ Exchange rates from Bloomberg; (2) The three listing compartments of Morocco are: Marché Principal, Marché Développement and Marché Croissance. These are the "main board", "development board" and "high growth/alternative market" respectively. Similarly the listings compartments in Tunisia are: Marché Principal and Le Marché Alternatif. These are "main board" and "Alternative SME market" respectively. In Egypt the separate autonomous Nilex exchange acts as the national SME alternative market.

**Table 3 Total costs on liquidity proxies and measures**

The results of the panel regression tests are based on a firm-monthly basis using bid-ask spread plus commission as the dependent variable. Three liquidity measurement variables are presented. Liu is the measure of Liu (2006) and represents a standardized turnover-adjusted number of zero returns over the prior month. Turnover is a ratio of the traded volume of shares in relation to total number of shares outstanding and is scaled by the number of trading days in the month of measurement. It provides a measure of trading frequency. The final measure is the Bid Ask spread which is the average daily relative bid ask spread over the prior 1 month, where daily relative spread is the local currency denominated spread divided by average of Bid and Ask prices. Firm size is determined from the first day of each month. Volatility is the average daily stock return variance and price and volume measure the average price (local currency units) and trading volume over an annual trading period. Turnover, price, volume, and market capitalisation are all log scaled in line with Stoll (2000). SME Firm development boards in Tunisia are accounted for by a dummy. N is the sample size in firm months. The White cross-section t-statistics are in parentheses. Bold values delineate those that are statistically significant in excess of 90% confidence margin

| | **Morocco: Marché Principal (N = 1,636)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Controls | Zero (%) | Amihud | Liu | Turnover | Overall | Overall |
| Intercept | 0.065 [14.75] † | 0.021 [6.43] † | 0.065 [14.76] † | 0.045 [7.41] † | -0.199 [-12.69] † | -0.105 [-5.01] † | -0.102 [-4.95] † |
| % Zero Returns | | **0.001 [18.94]** † | | | | **0.0001 [4.50]** † | **0.0001 [4.76]** † |
| Amihud | | | 2.26E-05 [0.98] | | | -2.74E-06 [-0.31] | -3.05E-06 [-0.35] |
| Liu | | | | **0.002 [4.11]** † | | **0.001 [5.51]** † | **0.001 [5.53]** † |
| Turnover | | | | | **0.022 [14.77]** † | **0.012 [5.82]** † | **0.012 [5.78]** † |
| **Institutional Controls** | | | | | | | |
| Arab Spring | 0.004 [4.53] † | 0.003 [4.50] † | 0.004 [4.53] † | 0.004 [5.42] † | 0.004 [5.42] † | 0.004 [5.18] † | 0.004 [5.22] |
| **Ownership Controls** | | | | | | | |
| State | -0.004 [-5.45] † | 4.79E-05 [0.08] | -0.004 [-5.21] † | -0.001 [-1.42]* | 4.70E-05 [0.08] | 0.001 [1.20] | 0.001 [1.64]* |
| Foreign Partner | -0.002 [-3.14] † | -0.003 [-3.38] † | -0.002 [-3.05] † | -0.001 [-1.44]* | -0.0002 [-0.22] | -0.001 [-1.29]* | -0.001 [-1.62]* |
| Founder | 0.001 [0.85] | -0.002 [-1.96]** | 0.001 [0.79] | -0.002 [-2.37] † | -0.003 [-4.26] † | -0.003 [-4.09] † | -0.003 [-4.06] † |
| Single Family | -0.009 [-8.01] † | -0.005 [-4.65] † | -0.009 [-7.69] † | -0.005 [-4.04] † | -0.001 [-1.36]* | -0.002 [-1.78]** | -0.002 [-2.86] † |
| Family/ Business Group | -0.002 [-4.05] † | -0.002 [-2.46] † | -0.002 [-3.98] † | -0.001 [-1.68]** | 0.001 [1.12] | 0.0001 [0.18] | -- -- |
| SNI (business group) | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -0.002 [-3.88] † |
| Domestic VC | 0.003 [3.94] † | 0.002 [3.36] † | 0.003 [4.06] † | 0.002 [3.83] † | 0.001 [2.27]** | 0.001 [2.78] † | 0.002 [3.29] † |
| Foreign VC | -0.005 [-7.05] † | -0.003 [-4.60] † | -0.005 [-7.14] † | -0.004 [-5.38] † | -0.001 [-1.93]** | -0.002 [-2.97] † | -0.002 [-4.00] † |
| **Market Controls** | | | | | | | |
| Price | -0.003 [-5.17] † | -0.002 [-3.31] † | -0.003 [-4.74] † | 9.05E-05 [0.14] | -0.022 [-14.16] † | -0.012 [-5.72] † | -0.012 [-5.64] † |
| Volatility | 0.593 [9.82] † | 0.879 [16.55] † | 0.590 [9.71] † | 0.605 [11.32] † | 0.711 [14.90] † | 0.765 [13.49] † | 0.775 [13.68] † |
| Volume | -0.005 [-13.69] † | -0.002 [-7.82] † | -0.005 [-13.35] † | -0.001 [-1.97] † | -0.024 [-16.95] † | -0.013 [-6.37] † | -0.013 [-6.30] † |
| Size | 0.001 [2.34] † | -6.26E-05 [-0.19] | 0.001 [2.20]** | -0.001 [-2.82] † | 0.022 [14.98] † | 0.011 [5.41] † | 0.011 [5.33] † |
| Adj-$R^2$ (%) | 0.5420 | 0.6813 | 0.5433 | 0.6593 | 0.7062 | 0.7239 | 0.7253 |

| | **Morocco: Marché Développement (N = 556)** | | | | | |
|---|---|---|---|---|---|---|
| | Controls | Zero (%) | Amihud | Liu | Turnover | Overall |
| Intercept | -0.149 [-5.84] † | -0.107 [-4.92] † | -0.153 [-6.00] † | -0.093 [-3.54] † | -0.300 [-11.35] † | -0.197 [-4.35] † |
| % Zero Returns | | **0.001 [14.50]** † | | | | **4.69E-04 [5.51]** † |
| Amihud | | | **3.60E-05 [1.88]**** | | | 2.36E-06 [0.15] |
| Liu | | | | **0.002 [7.00]** † | | -2.45E-05 [-0.06] |
| Turnover | | | | | **0.021 [7.28]** † | **0.010 [2.13]**** |
| **Institutional Controls** | | | | | | |
| Arab Spring | 0.008 [5.50] † | 0.006 [4.79] † | 0.008 [5.37] † | 0.007 [5.75] † | 0.006 [5.22] † | 0.006 [4.85] † |
| **Ownership Controls** | | | | | | |
| State | 0.010 [1.87]** | 0.011 [2.30]** | 0.010 [1.82]** | 0.009 [1.80]** | 0.011 [2.29]** | 0.011 [2.32] † |
| Foreign Partner | -0.0002 [-0.02] | 0.004 [0.67] | -0.0004 [-0.07] | 0.009 [1.27] | 0.007 [1.08] | 0.006 [0.93] |
| Founder | -0.007 [-4.01] † | -0.001 [-0.76] | -0.006 [-3.81] † | -0.0001 [-0.07] | -0.001 [-0.52] | -0.0005 [-0.23] |
| Single Family | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| Family/ Business Group | -0.003 [-1.71]** | -0.003 [-1.58]* | -0.003 [-1.53]* | -0.0005 [-0.24] | -0.002 [-1.28]* | -0.002 [-1.28]* |
| SNI (business group) | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| Domestic VC | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| Foreign VC | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| **Market Controls** | | | | | | |
| Price | -0.004 [-5.97] † | -0.003 [-3.83] † | -0.004 [-5.18] † | -0.002 [-2.30] † | -0.024 [-8.24] † | -0.013 [-2.63] † |
| Volatility | 0.803 [5.86] † | 1.298 [10.89] † | 0.790 [5.75] † | 0.909 [7.79] † | 1.162 [11.53] † | 1.300 [12.45] † |
| Volume | -0.005 [-9.10] † | -0.002 [-3.74] † | -0.005 [-8.89] † | -7.69E-05 [-0.11] | -0.023 [-8.86] † | -0.012 [-2.41] † |
| Size | 0.012 [10.01] † | 0.006 [4.54] † | 0.012 [10.07] † | 0.005 [2.96] † | 0.026 [13.14] † | 0.015 [3.33] † |
| Adj-$R^2$ (%) | 0.4769 | 0.6132 | 0.4778 | 0.5664 | 0.6009 | 0.6241 |

| | **Morocco: Marché Croissance (N = 584)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Controls | Zero (%) | Amihud | Liu | Turnover | Overall | Overall |
| Intercept | 0.055 [1.87]** | -0.005 [-0.17] | 0.054 [1.84]** | 0.049 [1.61]* | -0.184 [-4.18] † | -0.172 [-3.49] † | -0.109 [-2.35] † |
| % Zero Returns | | **0.001 [9.08]** † | | | | **4.01E-04 [3.90]** † | **3.72E-04 [3.39]** † |
| Amihud | | | 3.04E-05 [0.68] | | | 4.33E-05 [0.80] | 5.69E-05 [1.03] |
| Liu | | | | **0.001 [1.68]**** | | **-0.001 [-1.78]**** | **-0.001 [-1.82]**** |
| Turnover | | | | | **0.018 [7.11]** † | **0.015 [4.37]** † | **0.014 [4.30]** † |
| **Institutional Controls** | | | | | | | |
| Arab Spring | 0.016 [6.83] † | 0.013 [6.00] † | 0.016 [6.85] † | 0.016 [6.76] † | 0.013 [6.14] † | 0.012 [5.66] † | 0.012 [5.87] † |
| **Ownership Controls** | | | | | | | |
| State | 0.011 [1.38]* | 0.016 [2.20]** | 0.011 [1.34]* | 0.012 [1.47]* | 0.016 [2.02]** | 0.017 [2.25]** | 0.010 [1.50]* |
| Foreign Partner | 0.022 [6.40] † | 0.012 [3.44] † | 0.022 [6.31] † | 0.020 [5.46] † | 0.01 [2.49] † | 0.009 [2.16]** | 0.018 [4.53] † |
| Founder | 0.242 [2.04]** | 0.236 [1.93]** | 0.243 [2.03]** | 0.241 [2.00]** | 0.231 [1.85]** | 0.230 [1.85]** | 0.226 [1.81]** |
| Single Family | -0.002 [-0.65] | -0.003 [-1.00] | -0.002 [-0.60] | -0.002 [-0.70] | -0.003 [-1.03] | -0.003 [-1.10] | 0.004 [2.11]** |
| Family/ Business Group | -0.007 [-1.48]* | -0.012 [-2.54] † | -0.007 [-1.44]* | -0.007 [-1.52]* | -0.009 [-2.01]** | -0.011 [-2.58] † | -- -- |
| SNI (business group) | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | 0.009 [2.09]** |
| Domestic VC | -0.002 [-0.18] | -0.016 [-1.56]* | -0.001 [-0.12] | -0.004 [-0.33] | -0.013 [-1.28]* | -0.017 [-1.65]** | 0.002 [0.20] |
| Foreign VC | -0.007 [-2.90] † | -0.004 [-2.05]** | -0.007 [-2.90] † | -0.007 [-2.88] † | -0.004 [-2.27]** | -0.003 [-1.80]** | -0.001 [-0.38] |
| **Market Controls** | | | | | | | |
| Price | 9.64E-05 [0.07] | -0.002 [-1.40]* | 3.14E-04 [0.21] | 0.001 [0.48] | -0.020 [-5.86] † | -0.018 [-4.13] † | -0.018 [-4.18] † |
| Volatility | 0.793 [5.17] † | 1.174 [8.92] † | 0.772 [5.18] † | 0.789 [5.08] † | 0.971 [6.17] † | 1.145 [7.58] † | 1.129 [7.30] † |
| Volume | -0.005 [-6.43] † | -0.002 [-2.50] † | -0.004 [-6.24] † | -0.003 [-2.17]** | -0.019 [-9.09] † | -0.016 [-4.86] † | -0.016 [-4.82] † |
| Size | 0.0001 [0.07] | 0.001 [0.36] | 2.58E-05 [0.01] | -0.001 [-0.57] | 0.019 [5.87] † | 0.017 [3.99] † | 0.013 [3.19] † |
| Adj-$R^2$ (%) | 0.4623 | 0.5032 | 0.4616 | 0.4670 | 0.5079 | 0.5171 | 0.5178 |

| | **Tunisia: Overall (N = 5,836)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Controls | Zero (%) | Amihud | Liu | Turnover | Overall | Overall |
| Intercept | 0.098 [26.40] † | 0.071 [13.29] † | 0.097 [26.54] † | 0.078 [14.17] † | -0.021 [-1.80]** | -0.010 [-0.52] | -0.015 [-0.80] |
| % Zero Returns | | **2.11E-04 [9.90]** † | | | | **9.97E-05 [3.12]** † | **1.06E-04 [3.28]** † |
| Amihud | | | **-2.55E-07 [-7.71]** † | | | **-2.45E-07 [-6.49]** † | **-2.45E-07 [-6.52]** † |
| Liu | | | | **0.001 [4.75]** † | | 5.92E-05 [0.23] | 4.17E-05 [0.16] |
| Turnover | | | | | **0.009 [9.45]** † | **0.007 [3.82]** † | **0.007 [3.83]** † |
| **Institutional Controls** | | | | | | | |
| Arab Spring | -4.70E-04 [-0.66] | 0.001 [1.07] | -0.001 [-0.72] | -0.0001 [-0.17] | 1.65E-06 [0.002] | 4.30E-04 [0.70] | 3.14E-04 [0.51] |
| Alternative Market | 0.004 [1.85]** | 0.004 [1.82]** | 0.004 [2.02]** | 0.003 [1.52]* | 0.003 [1.35]* | 0.004 [1.58]* | 0.003 [1.31]* |
| **Ownership Controls** | | | | | | | |
| State | -0.002 [-3.86] † | -0.002 [-4.11] † | -0.002 [-3.81] † | -0.002 [-3.58] † | -0.002 [-3.94] † | -0.002 [-3.95] † | -0.002 [-4.22] † |
| Foreign Partner | -4.87E-04 [-1.05] | -0.0004 [-0.83] | -0.0005 [-1.07] | -0.0003 [-0.55] | 1.50E-05 [0.03] | -3.64E-05 [-0.08] | -1.67E-04 [-0.38] |
| Founder | -0.003 [-3.20] † | -0.003 [-2.93] † | -0.003 [-3.29] † | -0.003 [-3.33] † | -0.003 [-3.21] † | -0.003 [-3.17] † | -0.003 [-3.01] † |
| Single Family | -0.001 [-1.29]* | -0.001 [-1.15] | -0.001 [-1.00] | -0.001 [-1.64]* | -0.001 [-1.57]* | -0.001 [-1.45]* | -0.001 [-1.48]* |
| Family/ Business Group | -0.0004 [-0.72] | -0.001 [-1.48]* | -3.67E-04 [-0.64] | -0.001 [-1.29]* | -0.001 [-1.28]* | -0.001 [-1.36]* | -- -- |
| Ben Ali (business group) | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -0.002 [-3.92] † |
| Domestic VC | -0.001 [-1.78]** | -0.001 [-1.32]* | -0.001 [-1.82]** | -0.002 [-2.25]** | -0.002 [-2.53] † | -0.002 [-2.21]** | -0.002 [-2.47] † |
| Foreign VC | -2.74E-04 [-0.57] | 1.80E-04 [0.38] | -2.83E-04 [-0.59] | -3.33E-05 [-0.07] | -3.37E-04 [-0.76] | -1.02E-04 [-0.24] | -0.001 [-1.86]** |
| **Market Controls** | | | | | | | |
| Price | -0.004 [-13.30] † | -0.003 [-7.11] † | -0.004 [-13.40] † | -0.003 [-7.02] † | -0.012 [-12.13] † | -0.009 [-4.57] † | -0.010 [-4.61] † |
| Volatility | 0.421 [7.76] † | 0.487 [7.39] † | 0.441 [7.90] † | 0.386 [6.98] † | 0.391 [7.04] † | 0.445 [6.41] † | 0.444 [6.40] † |
| Volume | -0.006 [-23.83] † | -0.005 [-15.93] † | -0.006 [-23.96] † | -0.004 [-9.58] † | -0.013 [-14.24] † | -0.011 [-5.27] † | -0.011 [-5.29] † |
| Size | -3.69E-04 [-1.44]* | -0.001 [-2.58] † | -0.0003 [-1.28]* | -0.001 [-3.96] † | 0.008 [8.42] † | 0.006 [3.16] † | 0.007 [3.30] † |
| Adj-$R^2$ (%) | 0.4154 | 0.4291 | 0.4166 | 0.4297 | 0.4390 | 0.4422 | 0.4431 |

| | **Egypt: EGX30 (N = 2,269)** | | | | | |
|---|---|---|---|---|---|---|
| | Controls | Zero (%) | Amihud | Liu | Turnover | Overall |
| Intercept | 0.078 [11.06] † | 0.054 [2.44] † | 0.076 [11.20] † | 0.037 [2.02]** | -0.327 [-1.89]** | -0.244 [-1.25] |
| % Zero Returns | | **4.07E-04 [1.28]*** | | | | **-3.56E-04 [-3.10]** † |
| Amihud | | | **1.26E-04 [1.54]*** | | | 4.48E-05 [0.62] |
| Liu | | | | **0.004 [2.08]**** | | **0.002 [1.30]*** |
| Turnover | | | | | **0.036 [2.29]**** | **0.028 [1.49]*** |
| **Institutional Controls** | | | | | | |
| Arab Spring | 0.020 [3.72] † | 0.019 [4.71] † | 0.020 [3.75] † | 0.017 [5.67] † | 0.017 [5.61] † | 0.017 [5.74] † |
| **Ownership Controls** | | | | | | |
| State | -0.004 [-1.51]* | -0.004 [-1.50]* | -0.004 [-1.54]* | -0.005 [-1.79]** | -0.006 [-1.99]** | -0.006 [-2.08]** |
| Foreign Partner | -0.002 [-1.59]* | -0.001 [-0.64] | -0.001 [-1.50]* | -0.001 [-1.28]* | -0.001 [-0.97] | -0.001 [-1.55]* |
| Founder | -0.009 [-4.31] † | -0.010 [-4.14] † | -0.009 [-4.53] † | -0.011 [-4.30] † | -0.012 [-4.44] † | -0.012 [-4.64] † |
| Single Family | 0.008 [4.47] † | 0.009 [4.53] † | 0.009 [4.68] † | 0.010 [5.03] † | 0.010 [5.19] † | 0.011 [5.51] † |
| Family/ Business Group | -0.006 [-3.00] † | -0.007 [-3.06] † | -0.006 [-3.14] † | -0.007 [-3.27] † | -0.008 [-3.40] † | -0.008 [-3.43] † |
| Domestic VC | -0.002 [-2.65] † | -0.003 [-2.60] † | -0.002 [-2.63] † | -0.003 [-2.94] † | -0.003 [-3.01] † | -0.003 [-2.99] † |
| Foreign VC | -0.008 [-5.13] † | -0.009 [-4.45] † | -0.008 [-5.43] † | -0.010 [-5.00] † | -0.010 [-5.08] † | -0.010 [-5.01] † |
| **Market Controls** | | | | | | |
| Price | 3.92E-04 [0.38] | 0.003 [1.05] | 0.001 [0.59] | 0.002 [1.57]* | -0.034 [-2.27]** | -0.027 [-1.43]* |
| Volatility | 0.159 [1.45]* | 0.138 [1.49]* | 0.147 [1.37]* | 0.061 [0.73] | 0.043 [0.61] | 0.021 [0.30] |
| Volume | -0.003 [-3.23] † | -0.001 [-1.38]* | -0.002 [-2.98] † | -0.0004 [-0.42] | -0.037 [-2.40] † | -0.029 [-1.52]* |
| Size | -0.001 [-1.06] | -0.001 [-1.73]** | -0.001 [-1.16] | -0.002 [-2.44] † | 0.034 [2.23]** | 0.027 [1.42]* |
| Adj-$R^2$ (%) | 0.1150 | 0.1280 | 0.1163 | 0.1567 | 0.1622 | 0.1660 |

| | **Egypt: Main Board (excl. EGX30) (N = 13,215)** | | | | | |
|---|---|---|---|---|---|---|
| | Controls | Zero (%) | Amihud | Liu | Turnover | Overall |
| Intercept | 0.146 [13.99] † | 0.124 [4.65] † | 0.143 [13.58] † | 0.139 [11.94] † | -0.023 [-0.30] | -0.022 [-0.40] |
| % Zero Returns | | 2.13E-04 [1.03] | | | | -1.04E-04 [-0.61] |
| Amihud | | | **3.78E-05 [2.40]** † | | | **2.92E-05 [1.83]**** |
| Liu | | | | **4.94E-04 [2.65]** † | | **2.29E-04 [2.12]**** |
| Turnover | | | | | **0.013 [2.32]** † | **0.014 [3.42]** † |
| **Institutional Controls** | | | | | | |
| Arab Spring | 0.023 [4.05] † | 0.023 [4.15] † | 0.023 [4.08] † | 0.023 [4.13] † | 0.023 [4.35] † | 0.023 [4.29] † |
| **Ownership Controls** | | | | | | |
| State | -0.008 [-8.94] † | -0.008 [-5.94] † | -0.008 [-8.90] † | -0.008 [-7.87] † | -0.007 [-5.06] † | -0.007 [-4.92] † |
| Foreign Partner | 0.003 [3.01] † | 0.003 [3.47] † | 0.003 [3.13] † | 0.003 [3.05] † | 0.003 [3.36] † | 0.003 [3.43] † |
| Founder | -0.011 [-5.73] † | -0.010 [-5.12] † | -0.010 [-5.70] † | -0.010 [-5.63] † | -0.009 [-5.19] † | -0.009 [-4.95] † |
| Single Family | 0.007 [5.55] † | 0.007 [5.63] † | 0.007 [5.47] † | 0.006 [5.52] † | 0.007 [5.79] † | 0.006 [5.57] † |
| Family/ Business Group | 0.002 [3.54] † | 0.002 [3.47] † | 0.002 [3.66] † | 0.002 [3.61] † | 0.002 [3.32] † | 0.002 [3.46] † |
| Domestic VC | -0.004 [-6.51] † | -0.004 [-5.61] † | -0.004 [-6.53] † | -0.004 [-6.21] | -0.004 [-5.95] | -0.004 [-5.62] † |
| Foreign VC | 2.77E-04 [0.22] | -3.80E-04 [-0.24] | 1.48E-04 [0.12] | 0.001 [0.41] | 1.77E-04 [0.14] | 0.001 [0.34] |
| **Market Controls** | | | | | | |
| Price | 0.003 [3.58] † | 0.005 [3.58] † | 0.004 [3.94] † | 0.004 [4.50] † | -0.009 [-1.57]* | -0.009 [-2.40] † |
| Volatility | 0.233 [4.38] † | 0.231 [4.32] † | 0.232 [4.43] † | 0.231 [4.39] † | 0.227 [4.18] † | 0.226 [4.25] † |
| Volume | -0.005 [-11.10] † | -0.004 [-4.12] † | -0.005 [-11.50] † | -0.004 [-8.04] † | -0.017 [-3.26] † | -0.017 [-4.65] † |
| Size | -0.002 [-4.88] † | -0.003 [-6.55] † | -0.002 [-4.96] † | -0.003 [-6.64] † | 0.011 [1.82]** | 0.011 [2.72] † |
| Adj-$R^2$ (%) | 0.2405 | 0.2437 | 0.2424 | 0.2458 | 0.2517 | 0.2542 |

| | **Egypt: Nilex (N = 142)** | | | | | |
|---|---|---|---|---|---|---|
| | Controls | Zero (%) | Amihud | Liu | Turnover | Overall |
| Intercept | 0.348 [1.97]** | 0.341 [1.98]** | 0.352 [2.00]** | 0.269 [1.59]* | 0.094 [0.48] | 0.285 [0.99] |
| % Zero Returns | | **0.001 [2.79]** † | | | | **0.001 [2.05]**** |
| Amihud | | | 2.83E-04 [0.58] | | | 2.71E-04 [0.63] |
| Liu | | | | **0.004 [2.09]**** | | 3.85E-04 [0.08] |
| Turnover | | | | | **0.020 [2.43]** † | 0.004 [0.21] |
| **Institutional Controls** | | | | | | |
| Arab Spring | 0.043 [2.71] † | 0.043 [3.41] † | 0.042 [2.75] † | 0.048 [3.18] † | 0.049 [3.27] † | 0.044 [3.56] † |
| **Ownership Controls** | | | | | | |
| State | -0.015 [-1.28]* | -0.017 [-1.28]* | -0.015 [-1.29]* | -0.012 [-0.88] | -0.014 [-0.98] | -0.017 [-1.29]* |
| Foreign Partner | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| Founder | 0.014 [1.05] | 0.016 [1.28]* | 0.013 [0.91] | 0.016 [1.29]* | 0.016 [1.29]* | 0.015 [1.28]* |
| Single Family | -0.021 [-1.29]* | -0.023 [-1.28]* | -0.022 [-1.28]* | -0.028 [-1.51]* | -0.026 [-1.50]* | -0.025 [-1.30]* |
| Family/ Business Group | 0.022 [0.91] | 0.020 [0.88] | 0.020 [0.86] | 0.014 [0.59] | 0.015 [0.66] | 0.016 [0.73] |
| Domestic VC | 0.029 [0.92] | 0.019 [0.66] | 0.030 [0.97] | 0.030 [1.04] | 0.018 [0.59] | 0.020 [0.69] |
| Foreign VC | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| **Market Controls** | | | | | | |
| Price | 0.010 [1.36]* | 0.011 [1.36]* | 0.011 [1.41]* | 0.004 [0.48] | -0.014 [-1.03] | 0.006 [0.27] |
| Volatility | 1.313 [5.12] † | 1.628 [5.95] † | 1.267 [5.15] † | 1.592 [5.27] † | 1.620 [5.50] † | 1.635 [5.48] † |
| Volume | -0.011 [-5.55] † | -0.007 [-3.12] † | -0.010 [-3.48] † | -0.005 [-1.28]* | -0.026 [-4.00] † | -0.010 [-0.44] |
| Size | -0.012 [-1.28]* | -0.018 [-1.60]* | -0.013 [-1.28]* | -0.015 [-1.36]* | 0.006 [0.48] | -0.015 [-0.56] |
| Adj-$R^2$ (%) | 0.1595 | 0.1959 | 0.1556 | 0.1808 | 0.1717 | 0.1807 |

Notes: (1) * p > 90% level; ** p > 95% level; † p > 99% level; (2) White cross section robust standard errors and covariances (d.f. corrected) (period clustering)

**Table 4 Likelihood ratio tests**

A likelihood ratio test, developed by Vuong (1989) for non-nested model selection, is presented for each country. The models compared are based on the regressions of the bid-ask spread and the Amihud (2002) measure, Turnover, the Liu (2006) measure of liquidity. The control variables are the natural logarithms of Traded Volume, price, market capitalisation and volatility, following Stoll (2000). A Z-statistic, using a one sided probability, is the basis of determining if the Amihud estimate or Turnover or Liu (the reference models) are better at explaining the true bid-ask spread data generating process than alternative liquidity proxies, or the comparison models tested either singularly or as a group. The group contains all the competing liquidity measures excluding the reference estimate. A positive and significant Z-statistic indicates that the comparison models are rejected in favour of the reference model. These cases are in bold type. N is sample size in firm-months. Bold values delineate those that are statistically significant in excess of 90% confidence margin

| **Market** | **N** | **Amihud versus** | | | | | **TO versus** | | | | **Liu versus** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Stoll** | **Zeros** | **TO** | **Liu** | **Group** | **Stoll** | **Zeros** | **Liu** | **Group** | **Stoll** | **Zeros** | **Group** |
| **Pre-Arab Spring** | | | | | | | | | | | | | |
| Morocco Marché Principal | 902 | -12.56† | -8.70† | **2.74†** | -9.89† | -10.84† | -16.36† | -11.54† | -12.20† | -14.92† | 1.08 | **3.38†** | **1.72**** |
| Morocco Marché Développement | 307 | -9.80† | -7.70† | -3.31† | -6.21† | -7.53† | -9.63† | -5.96† | -5.20† | -6.97† | -0.56 | -0.12 | -0.59 |
| Morocco Marché Croissance | 326 | -5.72† | -5.51† | -1.34* | -4.03† | -5.40† | -5.59† | -4.28† | -3.56† | -4.83† | -3.69† | -1.07 | -1.28* |
| Tunisia Overall | 4,853 | -17.71† | -15.15† | -8.27† | -11.41† | -14.17† | -18.39† | -12.72† | -9.08† | -12.39† | -5.42† | **3.31†** | **3.02†** |
| Egypt EGX30 | 1,763 | -2.22** | **1.28*** | 0.62 | -0.03 | -1.24 | -2.36† | **1.28*** | -0.47 | -1.46* | -2.00** | 0.89 | -0.44 |
| Egypt Main (excl. EGX30) | 10,394 | -5.51† | -1.66* | -2.18** | -3.07† | -4.14† | -4.86† | 0.02 | -1.73** | -2.30** | -4.66† | **2.20**** | 0.35 |
| **Post-Arab Spring** | | | | | | | | | | | | | |
| Morocco Marché Principal | 693 | -10.32† | -10.65† | -1.96** | -6.62† | -12.40† | -15.84† | -7.46† | -5.64† | -10.71† | -1.88** | 0.65 | 0.37 |
| Morocco Marché Développement | 235 | -11.77† | -8.90† | -2.69† | -5.88† | -7.67† | -9.00† | -6.39† | -5.23† | -7.14† | -2.63† | 0.23 | 0.09 |
| Morocco Marché Croissance | 242 | -6.45† | -3.28† | -1.38* | -2.22** | -2.94† | -7.77† | -2.91† | -1.98** | -3.28† | -4.88† | -0.53 | -1.87** |
| Tunisia Overall | 938 | -7.43† | -5.78† | -2.26** | -5.95† | -6.66† | -9.01† | -6.43† | -5.98† | -7.18† | -0.35 | **2.39†** | **1.90**** |
| Egypt EGX30 | 478 | -3.45† | -3.71† | -0.31 | -6.70† | -6.72† | -3.51† | -3.77† | -6.83† | -6.01† | **3.20†** | **3.06†** | **1.61*** |
| Egypt Main (excl. EGX30) | 2,651 | -2.47† | -3.01† | **2.14**** | 0.02 | -3.29† | -2.85† | -3.46† | -0.91 | -4.28† | -2.00** | -4.28† | -5.48† |

Notes: (1) * p > 90% level; ** p > 95% level; † p > 99% level; (2) White cross section robust standard errors and covariances (d.f. corrected) (period clustering)

**Table 5 Institutional quality determinants of liquidity and price discovery random effects tests**

Market random effects regression coefficients are reported for monthly liquidity measures on each of the seven institutional quality measures for each sample group market. Seven markets are considered in all: 3 in Morocco: Marché Principal, Marché Développement, Marché Croissance, 1 in Tunisia, Tunisia overall, and three in Egypt: constituents of EGX, those stocks on main board outside of EGX30, and Nilex. The seven institutional quality measures are disseminated by ICRG (PRS Group). Liquidity measure dependent variable is the bid ask spread. The firm liquidity characteristics are price, volume and daily return volatility. Price and volume are natural log scaled, in line with Stoll (2000). Bold values delineate those that are statistically significant in excess of 90% confidence margin. N is sample size. The sample sizes of 175 (pre-Arab Spring) and 144 (post-Arab Spring) are monthly time series formed from cross sectional averages (averages of across all stocks in each market universe) for each respective market. Algeria is excluded from samples as is a Call Auction trading system and not quote driven (no bid/ ask prices)

| Political Institutional measure | Corruption | Investment Profile | Government Stability | Socio Economic Conditions | Military in Politics | Democratic Accountability | Law and Order |
|---|---|---|---|---|---|---|---|
| | **Bid Ask Spread (Illiquidity) - Pre-Arab Spring (N = 175)** | | | | | | |
| Intercept | 0.186 [2.91] †† | 0.414 [4.75] †† | 0.223 [2.56] † | 0.565 [6.69] †† | 0.307 [2.01]** | 0.166 [2.60] †† | 0.484 [4.65] †† |
| Corruption | **-0.015 [-3.87]** †† | | | | | | |
| Investment Profile | | **-0.024 [-4.57]** †† | | | | | |
| Government Stability | | | -0.002 [-0.71] | | | | |
| Socio Economic Conditions | | | | **-0.063 [-7.30]** †† | | | |
| Military in Politics | | | | | -0.030 [-0.92] | | |
| Democratic Accountability | | | | | | **0.015 [1.28]*** | |
| Law and Order | | | | | | | **-0.056 [-4.55]** †† |
| Market Cap. | 0.001 [0.07] | -0.010 [-1.02] | -0.003 [-0.30] | -0.011 [-1.28]* | -0.004 [-0.40] | 0.001 [0.12] | -0.012 [-1.28]* |
| Traded Volume | -0.012 [-3.20] †† | -0.014 [-3.34] †† | -0.013 [-3.34] †† | -0.015 [-3.98] †† | -0.014 [-3.55] †† | -0.013 [-3.03] †† | -0.014 [-3.57] †† |
| Volatility | 0.215 [4.38] †† | 0.194 [3.27] †† | 0.223 [4.61] †† | 0.173 [3.64] †† | 0.226 [3.87] †† | 0.178 [4.37] †† | 0.176 [2.65] † |
| Price | -0.020 [-1.28]* | -0.002 [-0.14] | -0.028 [-1.79]** | 0.015 [0.99] | -0.019 [-1.28]* | -0.051 [-3.83] †† | -0.0001 [-0.01] |
| | **Bid Ask Spread (Illiquidity) - Post-Arab Spring (N = 144)** | | | | | | |
| Intercept | 0.228 [2.57] †† | 0.414 [4.75] †† | 0.206 [2.38] † | 0.266 [2.08]** | 0.261 [3.10] †† | 0.192 [1.99]** | 0.349 [4.65] †† |
| Corruption | **-0.022 [-2.16]**** | | | | | | |
| Investment Profile | | **-0.024 [-4.57]** †† | | | | | |
| Government Stability | | | **-0.006 [-1.28]*** | | | | |
| Socio Economic Conditions | | | | **-0.019 [-1.43]*** | | | |
| Military in Politics | | | | | **-0.019 [-3.66]** †† | | |
| Democratic Accountability | | | | | | **-0.016 [-1.89]**** | |
| Law and Order | | | | | | | **-0.031 [-4.13]** †† |
| Market Cap. | -0.010 [-1.03] | -0.010 [-1.02] | -0.008 [-0.87] | -0.009 [-0.84] | -0.014 [-1.40]* | -0.011 [-0.98] | -0.019 [-2.26] † |
| Traded Volume | -0.007 [-5.89] †† | -0.014 [-3.34] †† | -0.007 [-5.46] †† | -0.008 [-7.13] †† | -0.009 [-9.49] †† | -0.007 [-7.09] †† | -0.007 [-6.91] †† |
| Volatility | -0.298 [-1.34]* | 0.194 [3.27] †† | -0.215 [-0.79] | -0.248 [-1.08] | -0.275 [-0.94] | -0.282 [-1.28]* | -0.345 [-1.38]* |
| Price | 0.007 [0.79] | -0.002 [-0.14] | 0.005 [0.44] | 0.013 [1.28]* | 0.016 [1.35]* | 0.026 [2.33] † | 0.025 [3.52] †† |

Notes: (1) * p > 90% level; ** p > 95% level; † p > 99% level; †† p > 99.95% level;
(2) White cross section robust standard errors and covariances (d.f. corrected) (period clustering)

**Appendix Table 1. Summary of secondary market trading systems, regulations and commissions**

| | Trading procedures | Trading system and hours | Commissions |
|---|---|---|---|
| Algeria | Single Auction market:<br>(a) Session Opening: 10mins<br>(b) Order entry and order entry into electronic call system: 45mins<br>(c) Validation of orders at the call: 15mins<br>(d) Order processing: 10mins<br>(e) Block orders by institutional investors (declaration and registration of block trades): 10mins<br>(f) Final reporting to regulator: 15mins<br>(g) Official close of session | Call Auction (termed as "Le Fixing")<br><br>Monday and Wednesday only:<br>9-30am – 11-30am | Two secondary trading commissions:<br>(1) buy/sell leg broker commission of 0.15% of total trade size (trade min size is 10 Dinar, and max is 100,000 Dinar)<br>(2) Stock exchange transaction fee of 0.05% of total amount traded |
| Morocco | Two trading compartments: (1) Central market; (2) Block-trade market (termed as "Marché de blocs"). Order priority is given first on price and then on time of receipt into centralised order book.<br><br>(1) Central Market: all stock trades via either (1a) Auction or (1b) Continuous systems<br>(1a) Continuous system: 9-00am – 9-30am: Pre-Open; 9-30am - 15-30pm: Cont. Trading; 15-30pm-16-00pm: Pre-Close<br><br>(1b) Auction: 9-00am – 15-30pm (assuming 3 auctions). Trading by auction involves the matching of all orders entered beforehand into the electronic quote-driven trading system by brokerage firms so that, as the case may be, a single price is established for each security. As a function of a security's liquidity, several auctions may occur during a single session (multi-auction)<br><br>(2) Block-trade market ("Marché de blocs" - for large, irregular institutional block trades): OTC (Over the Counter) | Euronext ATOS system<br>Two systems in place: (1a) Continuous (liquid stocks) and (1b) Auction (illiquid stocks).<br>The decision criteria for individual stocks to trade on either system is based on following:<br>- Average trading volume per session;<br>- Average no. of securities traded per session;<br>- Frequency that the security has traded;<br>- Average no. of contracts per session;<br>- Free-float capitalisation<br><br>(1a) Continuous system: 9-00am-16-00pm<br><br>(1b) Auction: 9-00am – 15-30pm (assuming 3 auctions) | Two fees: (1) Casablanca Stock Exchange commission at 0.1% of the amount of trading in shares and (2) Brokerage commissions levied at a rate of 0.6% more than the amount of the transaction on shares. Finally the total amount of fees is itself subject to 10% VAT. |
| Tunisia | Two parallel systems: (1) Auction (also termed as "Le Fixing") and (2) Continuous.<br>(1) Auction/ Fixing:<br>(a) Pre-opening session (orders fed into central order book without any trading): 1 hour<br>(b) Auction: when the order accumulation phase ends, buy and sell orders are centrally matched through an auction procedure to establish an auction price The auction price of a share is its reference price and is used as a basis for the following auction.<br>(c) A second pre-opening session<br>(d) The second auction takes place<br>(e) A third pre-opening session<br>(f) The third auction takes place<br>(g) Trading at last price session; orders are traded at last quoted price | Euronext ATOS system (as in Morocco)<br>All listed securities are traded on the system. Orders entered by brokers at their terminals are forwarded to the central system and matched<br><br>Two parallel systems:<br>(1) Call auction (or "Le Fixing") for less liquid/traded securities. Fixed mode trading occurs three times daily at 10 am,11:30 am and 13 pm | Sliding scale of fees:<br>Trade value> TD 50,000 – 0.10% on buy and sell leg respectively<br><br>Trade value< TD 50,000 – 0.20% on buy and sell leg respectively |

| | Trading procedures | Trading system and hours | Commissions |
|---|---|---|---|
| Tunisia | (2) Continuous trading :<br>(a) Pre-opening session; in this one-hour period, orders entered by brokers are fed into the order book without any transactions taking place. The system calculates a theoretical opening price for all listed securities, which is displayed on the screens.<br>(b) Opening session by fixing; the system fixes the opening price or call auction price at which the largest number of bids and asks can be matched.<br>(c) Continuous trading; orders arriving in the system are immediately executed if the central order book contains an order or several orders of the contrary kind at a compatible price. If there are no such orders, the incoming order is recorded, remaining on the order book at the specified limit.<br>(d) Pre-closing session; all the orders in the book are matched for the closing auction.<br>(e) Trading at last price session; orders are traded at last quoted price. | (2) Continuous trading order-driven system for most liquid securities, daily from 9am to 14:10 pm | |
| Egypt | Electronic order-driven trading system with centralised order matching that supports 21 subsidiary "trading boards" for both listed and unlisted securities. Order priority is given on a price (first) and time (second) basis although a third decision tier is buy and sell orders in same security from same broker are deemed lowest priority. The most popular boards are:<br><br>(1) Main Market: No Price Limits (includes the most active traded stocks which are chosen based on a certain criteria) and Price Limits (the price of each stock is restricted to a 5% ceiling and floor from its previous closing price)<br>(2) Nilex Board (SME Board): Small and Medium Enterprises<br>(3) OTC Boards: This is comprised of "Deals market" and "Orders market":<br>(3a) "Deals Market" is the market at which EGX, announces all information, related to the pre-arranged deals, after their execution.<br>(3b) "Orders market" set for the companies that the Exchange approves trading on according to their liquidity, which also includes de-listed companies that were actively traded but de-listed due to their non-compliance with the Exchange listing rules. | EGX electronic order-driven system<br>The trading day begins at 9:45 am with the pre-opening session which is closed randomly by trading system between 10:15 am and 10:30 am<br><br>(1) Main Market: 10-30am – 14-30pm<br>(2) Nilex (SME market): 10-30am – 11-30am<br><br>(3) OTC Boards:<br>(3a) "Deals OTC": 9-45am – 11-15am<br><br>(3b) "Orders OTC": 12-30am – 13-00pm (Monday and Wednesday only) | Exchange service fees are levied at 0.12 per thousand of the value of each side of the transaction, with a maximum of LE 5,000 |

Source: Compiled by author from national securities exchange websites

Notes: (1) The exchanges of Egypt, Morocco and Tunisia have slightly modified trading hours during Islamic holy month of Ramadan

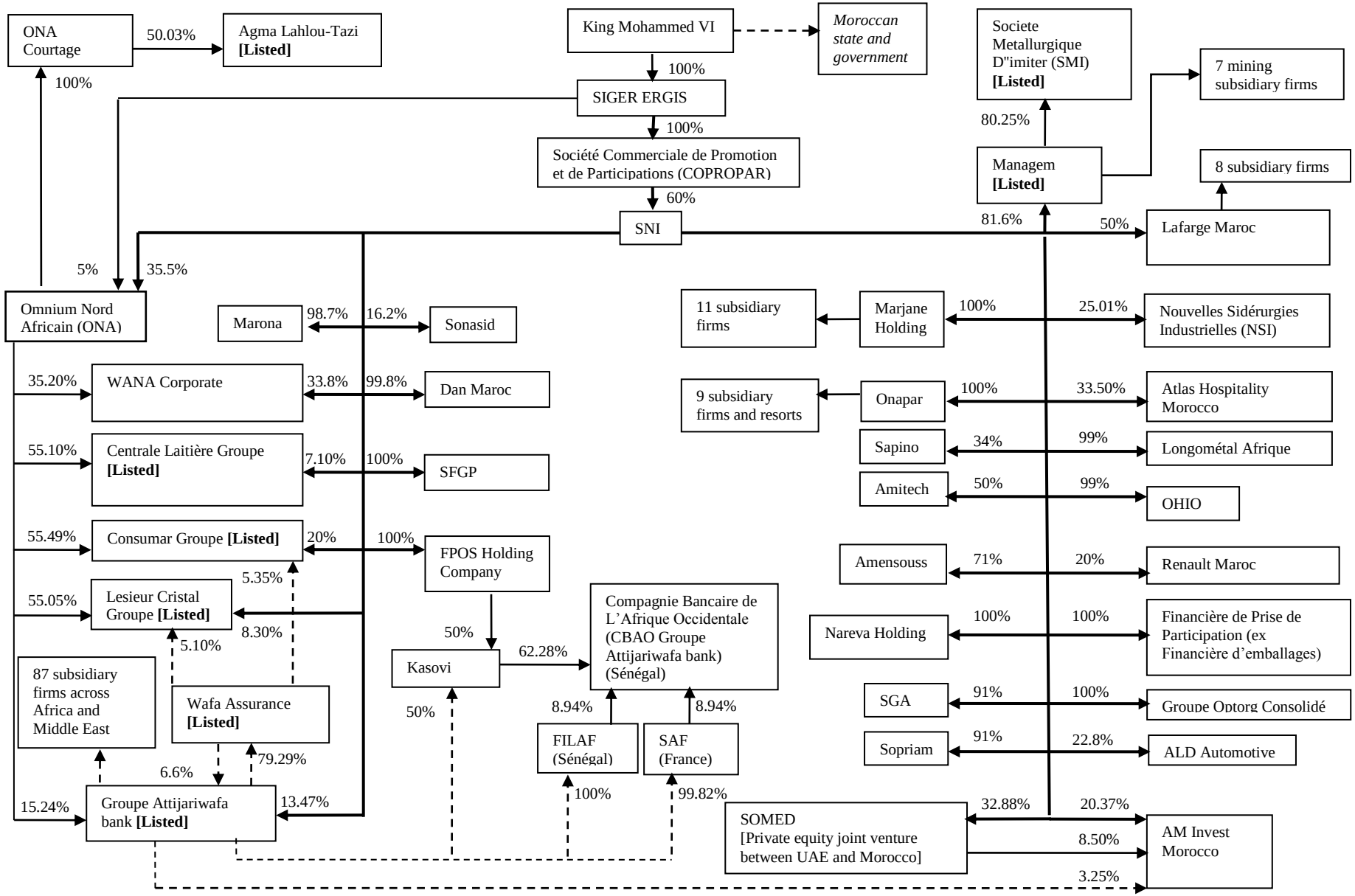
(2) It should be noted that the concept of trading boards specialising in unlisted, or delisted, securities in Egypt arises from the progressive implementation of onerous regulatory reforms across the Egyptian market from 2002 to 2010. These included enhanced financial reporting and accounting disclosure requirements (such as necessity for listed firms to formulate and publish costly annual and semi-annual reports). This caused an equally progressive shrinking of listed firms able to conform to these enhanced regulatory requirements from over 800 listed firms to the current total listings on Main board of 225 firms. Consequently firms delisted (i.e. unlisted) during these reforms trade on Egyptian exchange supported boards on an OTC basis benefitting from lighter (less onerous) regulatory and financial reporting requirements while still benefitting from association in being able to trade equity through an affiliation to the organized central market place of the national stock exchange. Organized trading in delisted and unlisted firms forms the basis for many of the 21 subsidiary boards supported by the Egyptian exchange outside of the prestigious official Main and Nilex boards.

**Appendix Table 2. Summary of secondary market regulations and fees for selected countries**

| | Regulator charged with market surveillance | Listing Compartment | Min. No. Shareholder | Min. Amount Issued | Min. Amount Issued (US$m) | No. Shares Issued | Min. Sales | No. Years Financial Statement |
|---|---|---|---|---|---|---|---|---|
| Algeria | Commission d'Organisation et de Surveillance des Opérations de Bourse (COSOB) | Compartiment des Actions | 300 | -- -- | -- -- | 20% of firm's capital | -- -- | 5 |
| Morocco | Conseil Déontologique des Valeurs Mobilières (CDVM) | Marché Principal | -- -- | MAD 75m | 8.44 | 250,000 | No fixed limit | 3 |
| | | Marché Développement | -- -- | MAD 25m | 2.81 | 100,000 | Over MAD 50m | 2 |
| | | Marché Croissance | -- -- | MAD 10m | 1.12 | 30,000 | No fixed limit | 1 |
| Tunisia | Conseil du Marché Financier (CMF) | Marché Principal | 200 | TD 3m | 1.87 | 10% of firm's capital | Profit over last 2 years | 2 |
| | | Le Marché Alternatif | 100 or 5 institutional shareholders | -- -- | -- -- | 20% of firm's capital | Profitability not a necessity | -- -- |
| Egypt | Egyptian Financial Services Authority (EFSA) | Main Market: Official (1) | 150 | L.E. 20m | 3.25 | 2,000,000 | Net profits before taxes for the last fiscal year >5% of paid-in capital | 3 |
| | | Main Market: Official (2) | As above | As above | As above | As above | As above | As above |
| | | Main Market: Unofficial (1) | 50 | L.E. 10m | 1.62 | 1,000,000 | As above | 2 |
| | | Main Market: Unofficial (2) | 50 | L.E. 5m | 0.81 | 500,000 | Net profits before taxes for the last fiscal year >1% of paid-in capital | 2 |
| | | Nilex | 25 | L.E. 50m | 8.12 | 100,000 | Discretion of listing committee | 1 |

Source: Compiled by author from national securities exchange websites

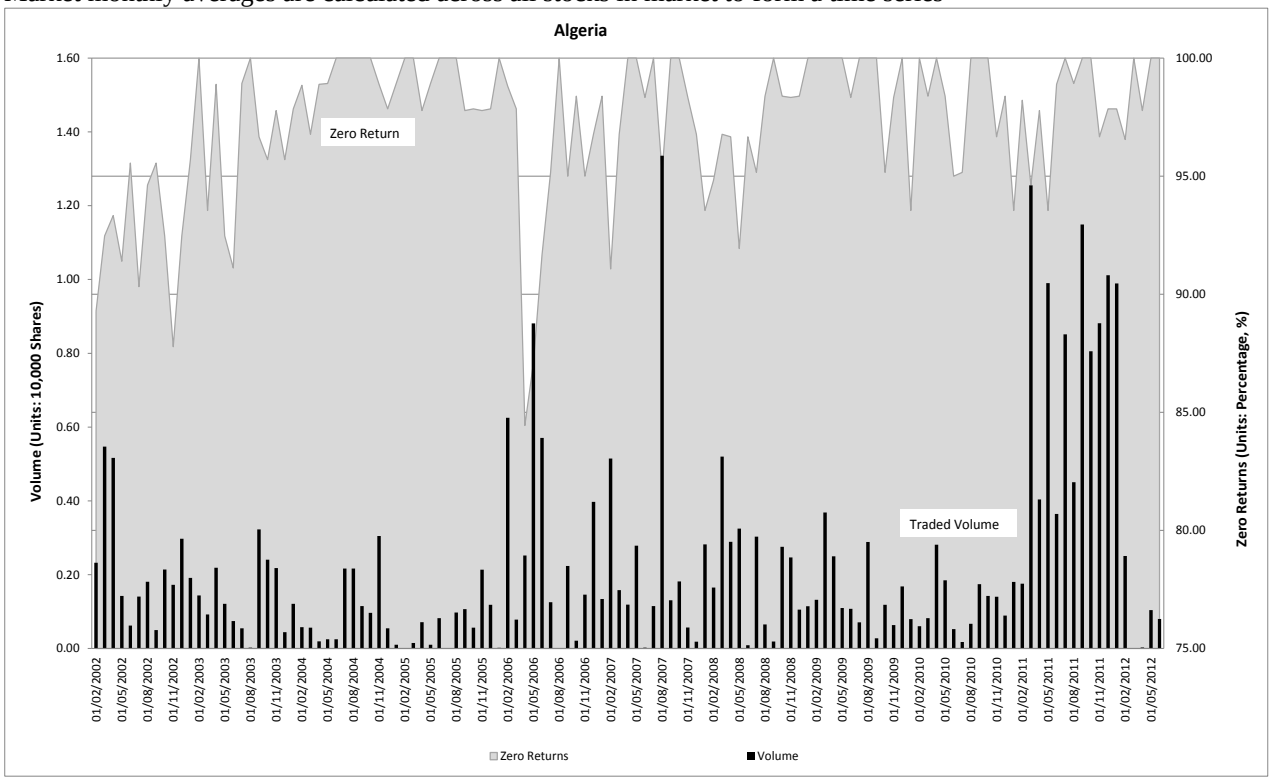
**Figure 1. Extent of control of Société Nationale d'Investissement (SNI) business group, 2010 – accounting for 12% of listings on Moroccan exchange**




Source: Compiled by author from SNI IPO listings prospectus and annual filings with Bourse de Casablanca and Moroccan regulator
Notes: (1) Listed indicates listing on Bourse de Casablanca; (2) The 87 subsidiary firms of Attijariwafa Bank form an extensive business group network of banking, finance and technology firms across mostly Francophone Africa

Figure 2. Evolution of liquidity and traded volume in Algeria (2002 – 2012)

Chart documenting the evolution of monthly averages of daily traded volumes and proportion of daily zero returns. Market monthly averages are calculated across all stocks in market to form a time series




Note: Trading system is call auction inferring no bid and ask prices (hence no bid-ask spread)

Figure 3. Evolution of liquidity and traded volume in Tunisia (2002 – 2012)

Chart documenting the evolution of monthly averages of daily traded volumes, monthly bid-ask spreads and proportion of daily zero returns. Market monthly averages are calculated across all stocks in market to form a time series

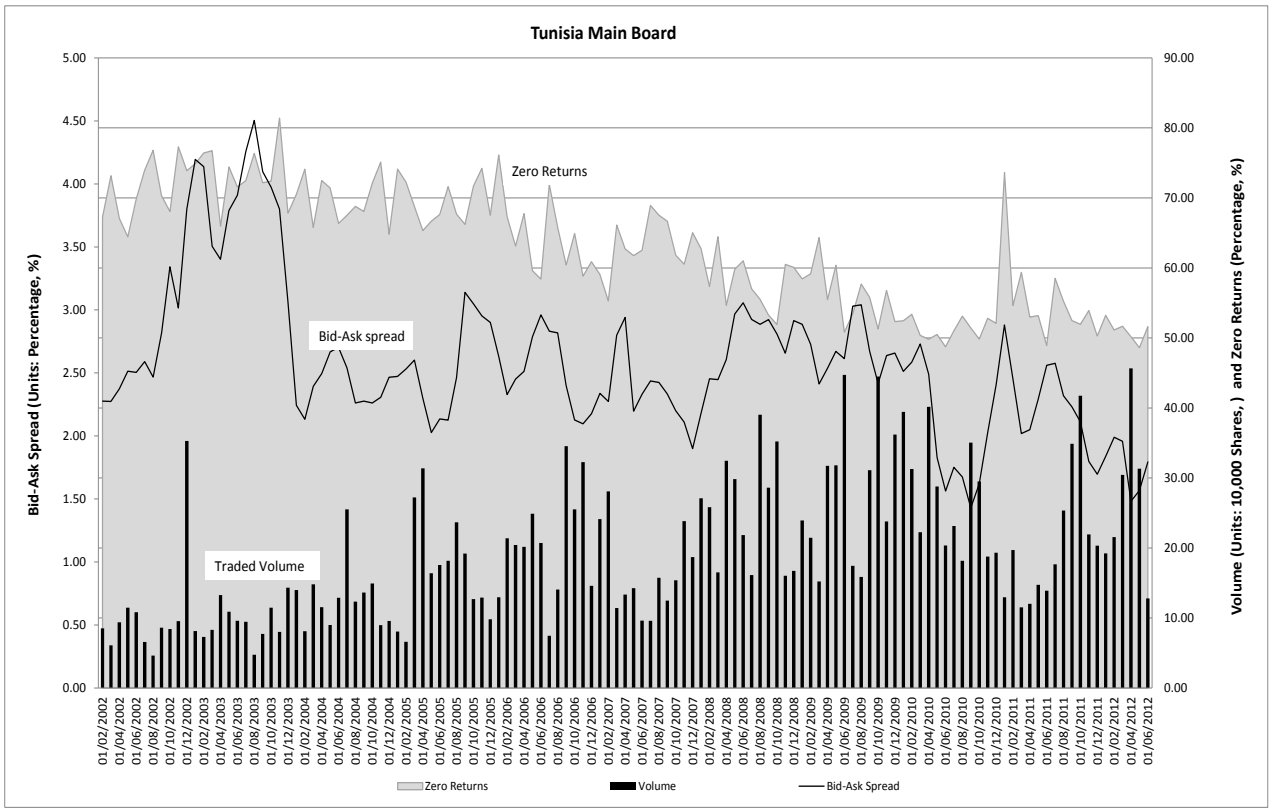
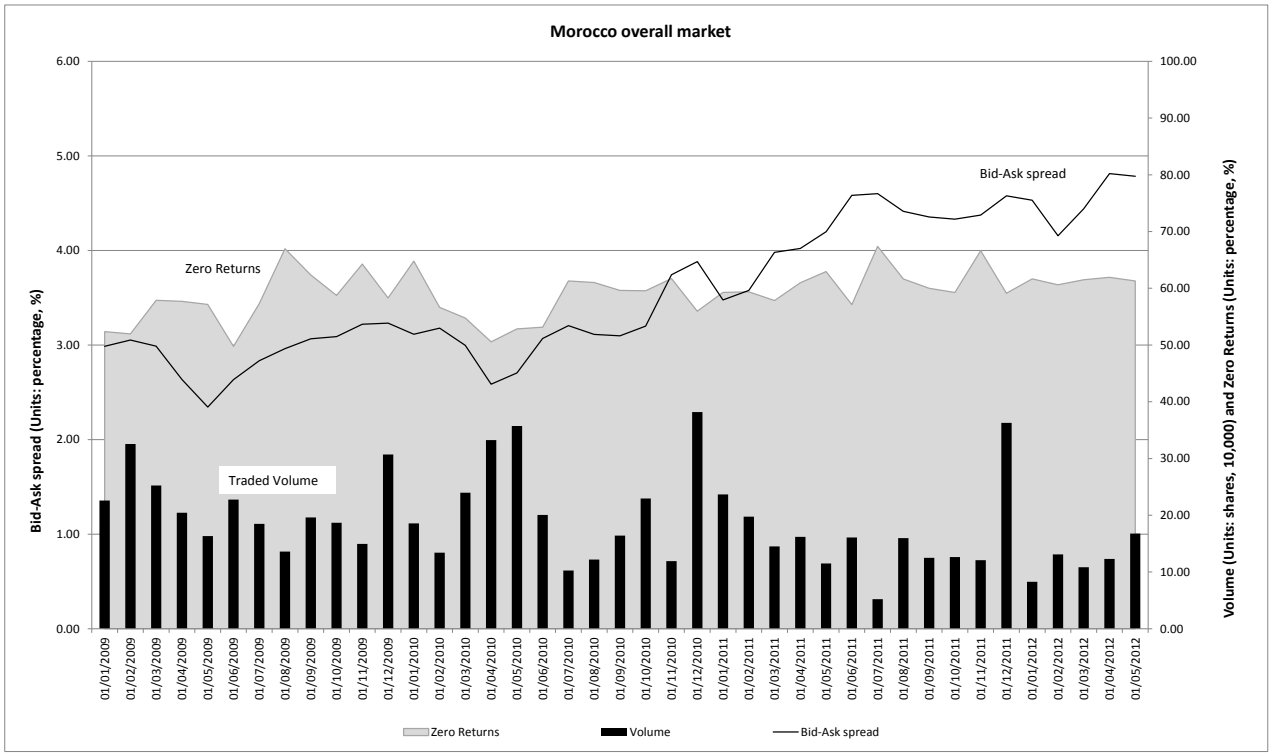


Figure 4. Evolution of liquidity and traded volume in Morocco (2009 – 2012)

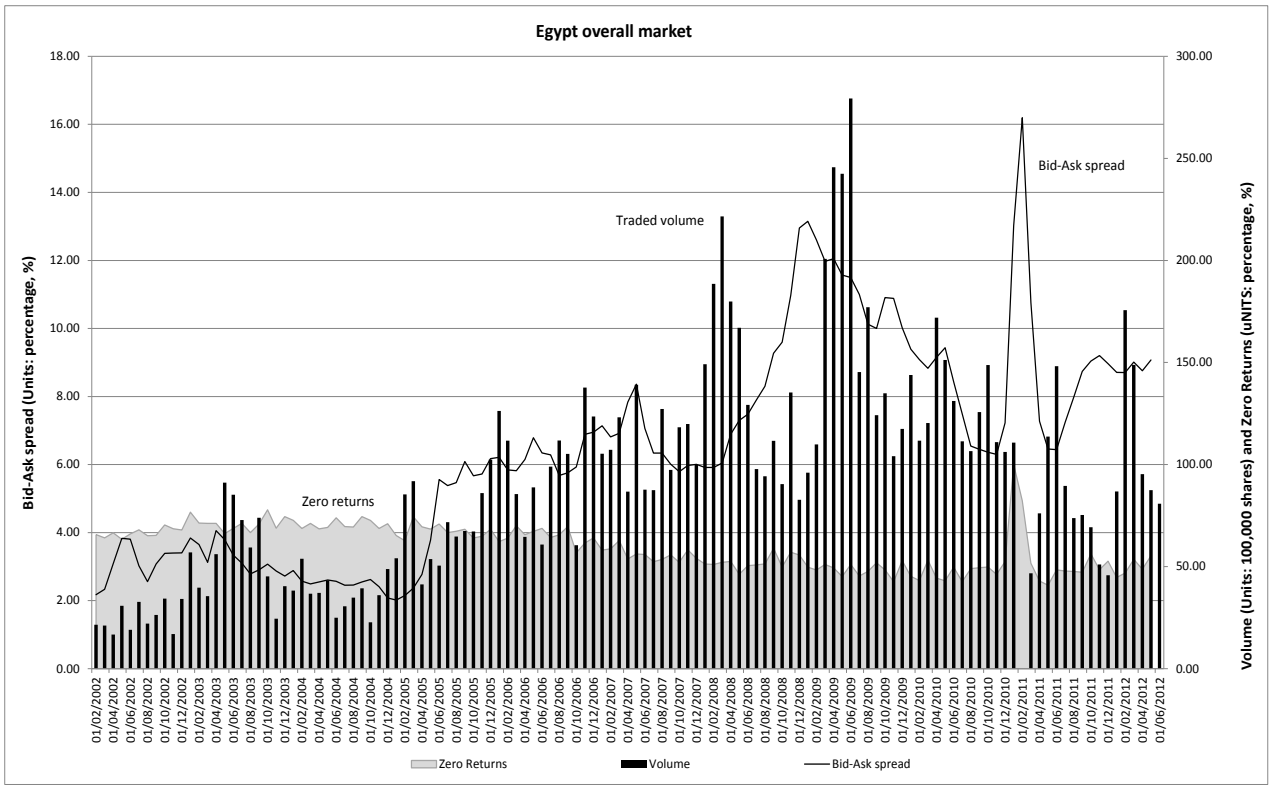
Chart documenting the evolution of monthly averages of daily traded volumes, monthly bid-ask spreads and proportion of daily zero returns. Market monthly averages are calculated across all stocks in market to form a time series




Note: Shorter length of data available from 2009 to 2012.

Figure 5. Evolution of liquidity and traded volume in Egypt (2002 – 2012)

Chart documenting the evolution of monthly averages of daily traded volumes, monthly bid-ask spreads and proportion of daily zero returns. Market monthly averages are calculated across all stocks in market to form a time series




Note: Units of volume traded are in 100,000 shares and not 10,000 shares as in all other markets. This is to take account of the significant size of Egyptian equity market